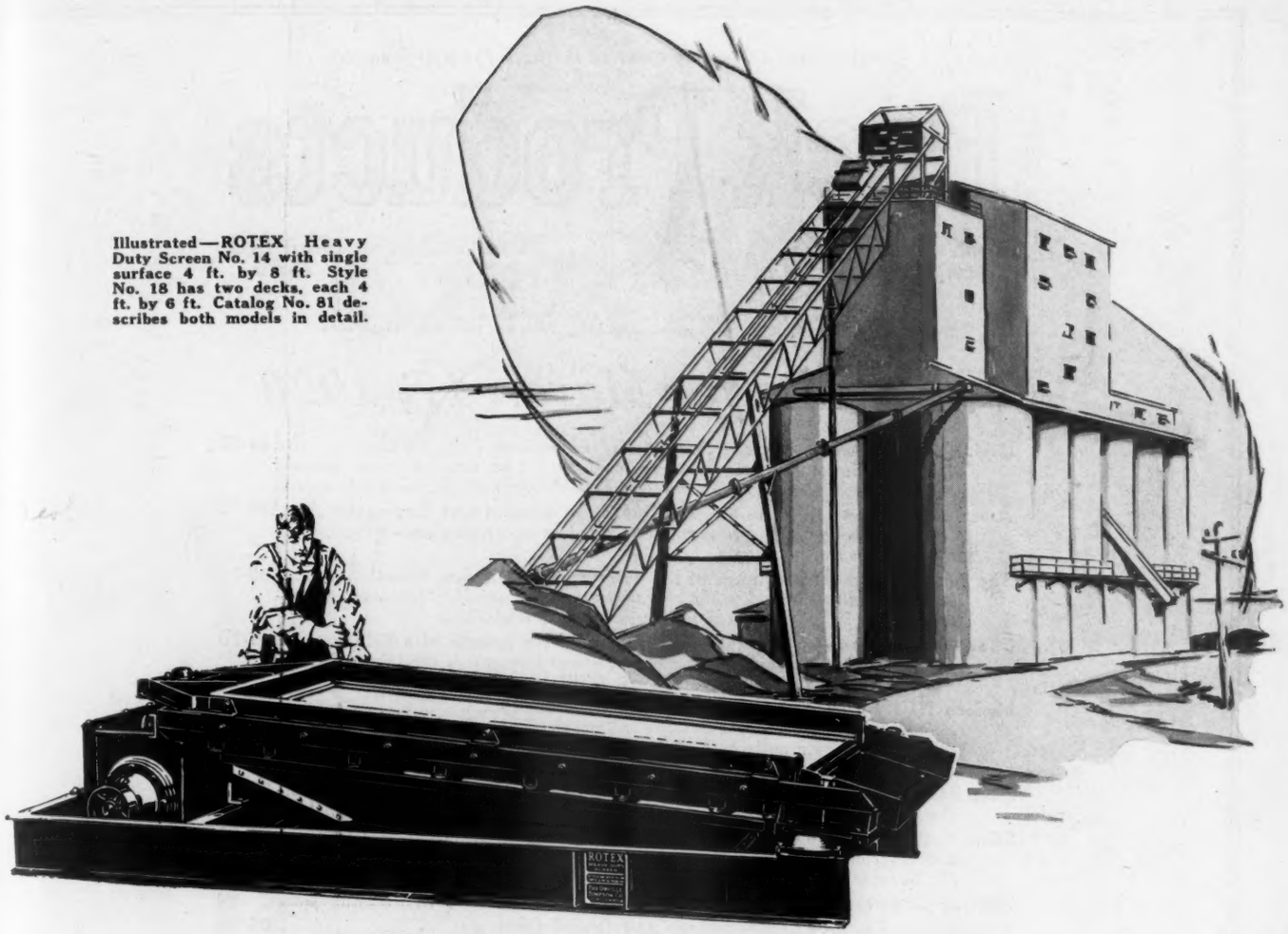
Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Chicago, March 17, 1928 (Issued Every Other Week) Volume XXXI, No. 6

MEMBER A. B. C. *The Only Paid Circulation covering the Rock Products Industry* MEMBER A. B. P.

Printing of This Issue Is 5450 Copies. Next Issue Will Be March 31



Illustrated—ROTEX Heavy Duty Screen No. 14 with single surface 4 ft. by 8 ft. Style No. 18 has two decks, each 4 ft. by 6 ft. Catalog No. 81 describes both models in detail.

ROTEX

During the past 10 months ROTEX screens of the Heavy Duty type have been shipped, and are in use, screening—

Limestone—Dry
(Many operations—from 1/16" to 1" openings)
Limestone—with washing sprays

Sand	**Refractory**
Gravel	**Phosphate Rock**
Slag	**Crushed Shell**
Pulverized Meat Scrap	

And—much to our gratification—we find that 71% of these shipments went into plants where ROTEX screens were already in use. We can imagine no testimonial more sincerely expressing a user's high esteem, than one in the shape of a repeat order.

The large, level, circular screen motion, and the patented "ball-and-bevel-strip" mesh cleaning system, are exclusive features of vital importance.

The
ORVILLE SIMPSON COMPANY
Office and Factory
1221 KNOWLTON ST. CINCINNATI, OHIO

When writing advertisers, please mention ROCK PRODUCTS

The Only Paid Circulation Covering the Rock Products Industry

Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

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Contents for March 17, 1928

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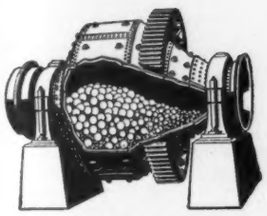
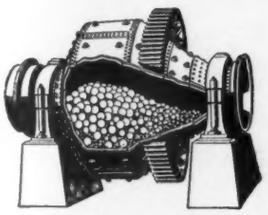
Grinding



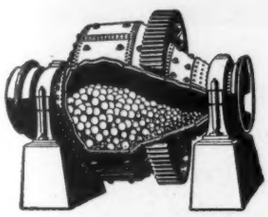
Cement Clinker

Both preliminary and finished grinding of Cement Clinker is being done in Hardinge Conical Mills. One 10 ft. mill in Canada, raw grinding an exceptionally hard Clinker, has a capacity of 125 to 140 barrels an hour.



Limestone

For agricultural purposes and for use as a rubber and composition filler is ground successfully in Hardinge Conical Mills. Finenesses up to 99% through 300 mesh are being secured.



Silica

Silica is being pulverized by both the wet and dry processes in the Hardinge Conical Mill. Where air classification is used, the Reverse Current Air Classifier has proven efficient and economical.

Send us your problem

HARDINGE COMPANY
YORK, PENNSYLVANIA
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SALT LAKE CITY UTAH: CONTINENTAL BANK BLDG.

HARDINGE

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This Pulverizer Sold a Gravel Pile

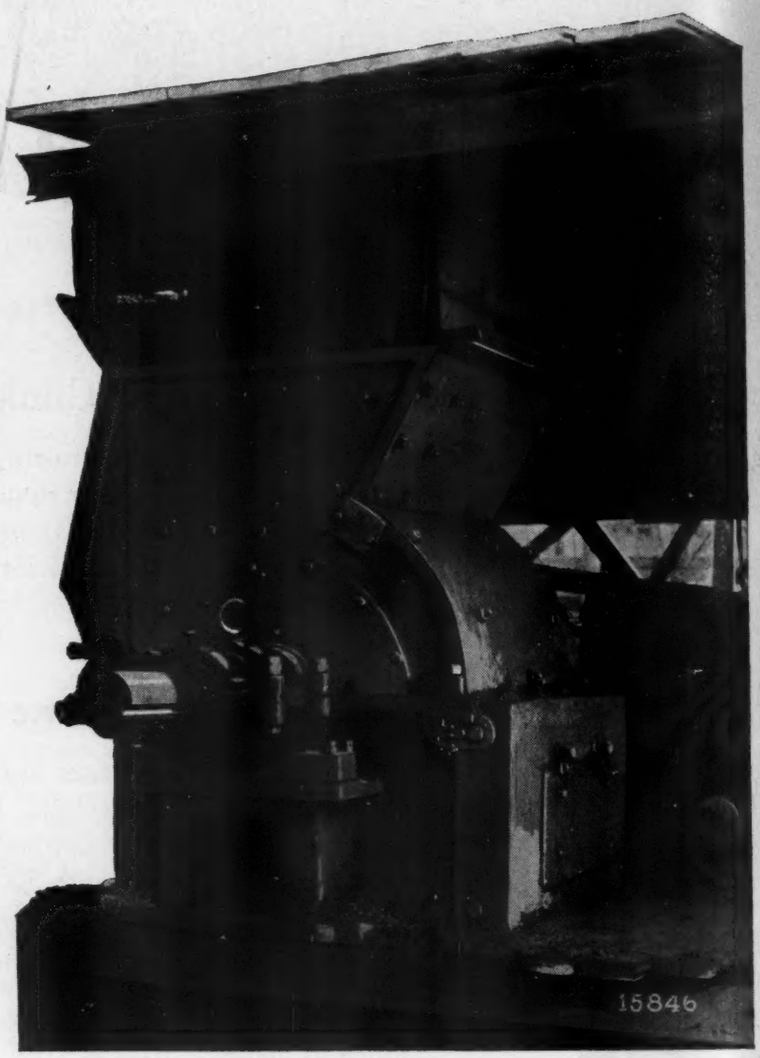
The Johnson Sand and Gravel Company's sandsucker in the Cuyahoga River near Cleveland brings up three hundred tons of gravel with the sand every day.

This gravel, from quarter-inch to six inches in size, is unmarketable as cement aggregate because slag from the nearby blast furnaces is cheap and plentiful.

Chutes had to be built to dump fifteen thousand tons of gravel outside the plant. It couldn't be sold.

Then a Jeffrey Type B. Swing Hammer Pulverizer was installed. The Jeffrey Pulverizer reduced the mountain of useless gravel to sand. Every ton of this sand, dumped into gondolas and sold right at the plant, brought a net profit of thirty-five cents.

Now the gravel is screened from the sand as it is pumped into the plant and sent direct to the Jeffrey Pulverizer. All rehandling is eliminated.



Send us a sample of your material and the capacity of your plant. Let us make a test to determine the Jeffrey Pulverizer that will do your particular job.

THE JEFFREY MANUFACTURING COMPANY
935-99 North Fourth St., Columbus, Ohio

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51 YEARS OF SERVICE TO INDUSTRY

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Elevators—Conveyors
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Crushers—Pulverizers
Sand and Gravel Handling, Washing and Screening Equipment
Locomotives
Coal Mine Equipment
Tipple Equipment
Ventilation Fans

Ingersoll-Rand Air line lubricator used with DCR-23 Jackhammer.

Waugh air line oiler lubricating a Gardner-Denver airdrill.

For *Resistance to Oil* "COMMANDER" AIR HOSE!

"COMMANDER"
The de luxe air drill hose. Oil-proof tube; extra-heavy braided cord reinforcement; double thickness, self-armoring cover.

"TYPE 50"
Tough and strong, yet light and easily handled. For pneumatic tools and light air drill service. Oil-resisting tube; multiple braided reinforcement.

"TYPE 88"
A wrapped construction air hose built of the same high-quality materials as "Commander."

Even if you use "line oilers" to lubricate your air drills, you'll find "Commander" standing up to its work months after ordinary air hose has given out.

The inner tube is a special oil-resisting rubber compounded to withstand the action of the most malignant mineral oils, which retains its strength from two to five times as long as ordinary rubber.

The cover is tough, brawny rubber, 50% stronger than you find on ordinary air hose—it will outwear any kind of steel armoring.

For lowest ultimate cost—Goodrich "Commander" Air Hose!

THE B. F. GOODRICH RUBBER CO.
Established 1870 Akron, Ohio

Goodrich AIR HOSE

"Type 50" "COMMANDER" "Type 88"

"Digs much more than anticipated—would not consider any other"

and after using 3 Gas + Air
BUCYRUS-ERIES
William C. Horn Co., of
Lock Haven, Pa.

bought another Gas+Air (their 4th)

They write: "The way these Gas+Air Machines handle rock is almost unbelievable. The output is much greater than we anticipated—our main trouble is to haul away the material.

"We would not consider any other make of shovel—and highly recommend Gas+Air BUCYRUS-ERIES for hard use. We now have four, the last two ordered by telephone." Making a total of eight BUCYRUS-ERIE Machines they have owned—in addition to others rented.

A Union of Strength

"BUCYRUS" and "ERIE"—each the most successful manufacturer in its particular field—consolidated Jan. 1, 1928. The unmatched resources of BUCYRUS-ERIE assure the buyer of Unequalled Value, More Efficient Machines, Permanence of the Manufacturer, and a More Complete Field Service.

Operator has the complete control so important on rock work—

Many times on Horn Company's work a big rock will start tumbling down the face, and only the operator's complete control over the dipper—with crowding and swinging engines in gear for instant action—enables him to stave off a smash.

But of course the feature of the BUCYRUS-ERIE Gas+Air that this successful company likes best is the *Bigger Production.*

The Repeat Orders for Gas+Air BUCYRUS-ERIES tell the story!

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY

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FLANGED RIM SPROCKETS
CHAMBERED-BARREL COMBINATION CHAIN
REINFORCED BACK MALLEABLE IRON BUCKETS

The Ideal Combination for Long Life

FOR heavy duty elevators handling acidulated, sticky, or semi-abrasive materials we recommend the Link-Belt Chambered-Barrel Combination Chain, carrying Link-Belt Reinforced Back Malleable Iron Buckets, and running on Link-Belt Flanged Rim Sprocket Wheels. Combined, they represent an unbeatable combination for long satisfactory service. Send for further particulars.

LINK-BELT COMPANY 3328

Leading Manufacturers of Elevating, Conveying, and Power Transmission Chains and Machinery

CHICAGO, 300 W. Pershing Road — INDIANAPOLIS, 200 S. Belmont Ave. — PHILADELPHIA, 2045 Hunting Park Ave.

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LINK-BELT

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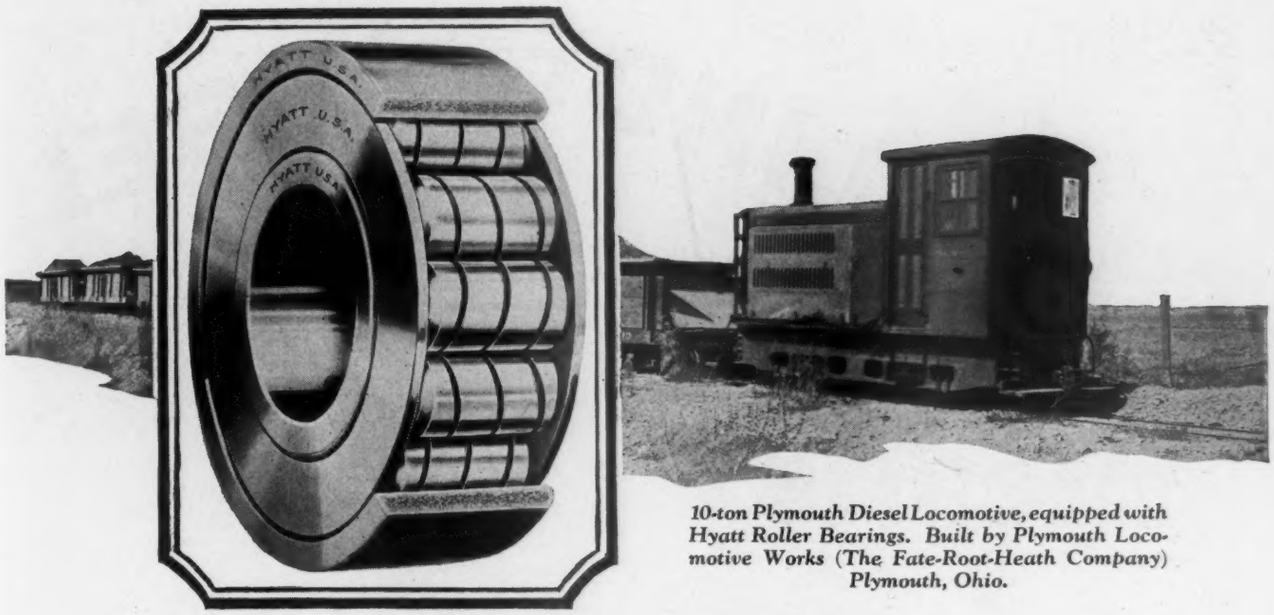

10-ton Plymouth Diesel Locomotive, equipped with Hyatt Roller Bearings. Built by Plymouth Locomotive Works (The Fate-Root-Heath Company) Plymouth, Ohio.

Plymouth Diesels, too, are Hyatt equipped

AFTER years of unwavering satisfaction with Hyatt Roller Bearings in thousands of Plymouth Gasoline Locomotives, it was natural for Plymouth to equip its new Diesel locomotives with these sturdy bearings.

Hyatts, with their easy rolling motion, avoid friction, wear and replacement. They seldom require lubricant — and *never* other attention. They soon pay their cost of installation through labor, power and lubricant savings.

Hyatts help speed up the jobs by avoiding the costly delays that usually accompany bearing breakdowns. One breakdown will more than pay for an entire Hyatt installation — and twenty, often thirty, years of flawless bearing service.

Small wonder, then, that Hyatts are standard in transportation, industrial, mining and agricultural equipment.

Why not insure continuous operation —and continuous economy—by specifying Hyatt equipment.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh Oakland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

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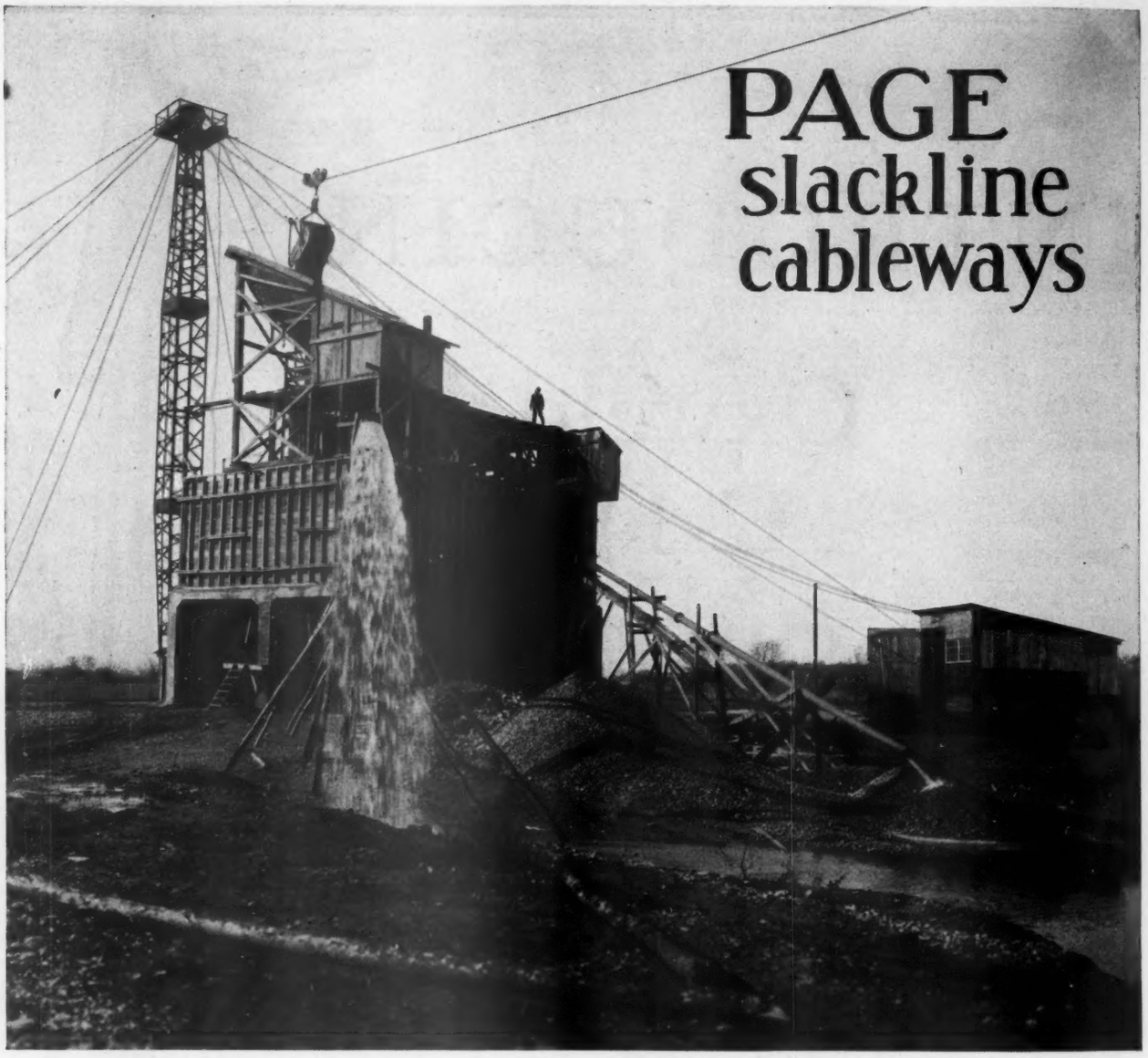


Geo. Boedecker Gravel Company, of Dayton, Ohio, Equipped with Page Slackline Cableway

SPEED—CONTINUOUS PRODUCTION—SIMPLICITY

In slackline operation, the Page Bucket will dig loose or hard material, and load quickly without burying itself. When it is hoisted, the front end comes up first, crowding the gravel back into the bucket and assuring a full load delivered to the hopper. It will carry a full load every trip.

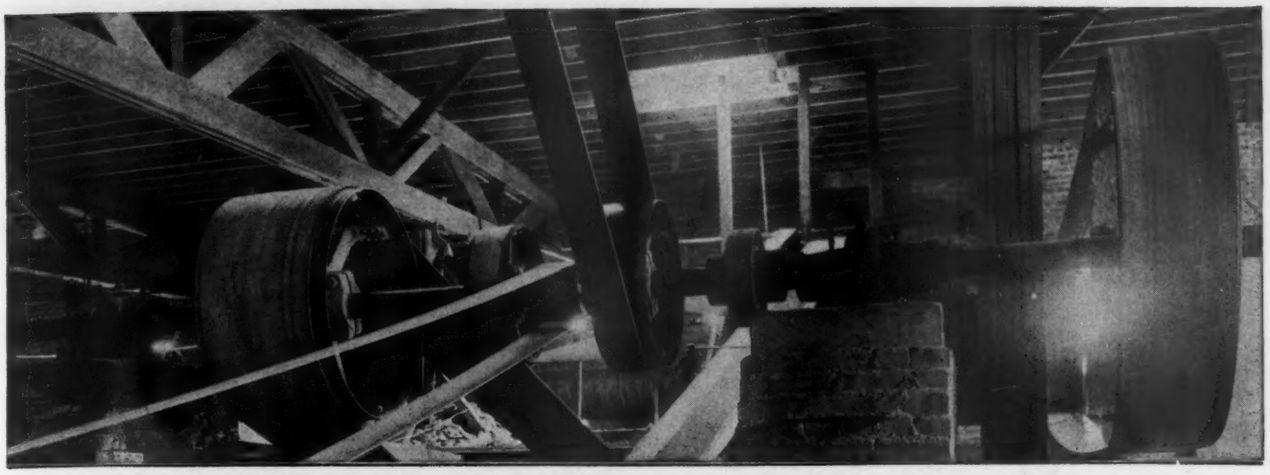
A simple, fool-proof, automatic locking device holds the bucket above the hopper, where it is dumped by gravity. The bucket can be dumped as fast or as slowly as the operator desires—no power is required to dump it.

Speed is guaranteed by quick loading and by the method of dumping. As the entire installation is free from complicated devices, expensive chains, sheaves, etc., the maintenance cost is correspondingly low.

The Page Engineering Company is prepared to furnish complete Cableway installations or buckets with the Cableway Control for any installation. Write for details.

PAGE ENGINEERING CO.

844 RUSH ST.
CHICAGO, ILL.



EQUIP YOUR PLANT WITH GOODYEAR

The right way to get the right belt or other mechanical rubber goods for your plant is to analyze the requirements of the job and have the equipment specified and built to the duty required.

That is the way Goodyear Mechanical Rubber Goods are specified by the G. T. M.—Goodyear Technical Man.

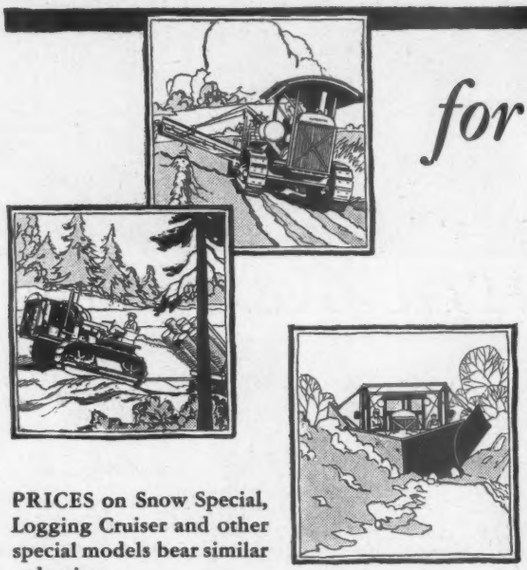
The result is that Goodyear Belts, Hose, Valves and Packing always give most efficient service and long, economical, trouble-free wear.

For detailed information, write to Goodyear, Akron, Ohio, or Los Angeles, California.

The Greatest Name in Rubber

GOODYEAR

Again...LOWER PRICES



for "Caterpillar" Tractors

...again the Caterpillar Tractor Co. passes on to purchasers the benefits of increased sales and consequent production economies. . . . Again it announces reductions in the prices of all sizes of the "Caterpillar" Tractor.

PRICES on Snow Special, Logging Cruiser and other special models bear similar reductions . . . . . .

NEW REDUCED PRICES

Effective January 27, 1928

SIXTY	THIRTY	TWENTY	2-TON
$4600	**$2650**	**$2175**	**$1675**
F. O. B. Peoria or San Leandro	F. O. B. Peoria or San Leandro	F. O. B. Peoria or San Leandro	F. O. B. Peoria

There is a "Caterpillar" Dealer near you.

CATERPILLAR TRACTOR CO.

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Distributing Warehouse: Albany, N. Y.
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Successor to
BEST (C. L. Best Tractor Co.) (The Holt Manufacturing Company) HOLT

CATERPILLAR
REG. U.S. PAT. OFF.

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This Simple Test

Cut Our Cable Costs in Two

THE first time I saw a piece of Tru-Lay Brand cable was in a nationally known testing laboratory.

The Director had a sample (left from some tests). Neither end was seized; that immediately commanded my attention. "That'll fly to pieces," I exclaimed. He laughed—unwrapped a strand—then a wire from the strand—reversed 'em—put 'em back —*good as ever.*

That convinced me. We had a hard-headed Superintendent but when I got a sample of my own I only had to stage one demonstration—he kept the sample.

To make a long story short, we put in some test cable—found it practically doubled the life, just as you might expect (for this cable eliminates torsional strain and puts an even load on all wires). Now Tru-Lay Brand is standard with us.

My advice is the thing I did—get a sample and stage your own demonstration.

A typical example of increased service and economy of Tru-Lay was reported by a contractor. He was working a shovel through clay and rock, using the shovel as a hoe. "Cat" locks were required. As he puts it: "When the hoe hit solid rock or stump, the engine stalled or the cable broke—and the engine didn't stall! Then we put on Tru-Lay. It completed the job of 15,000 lineal feet of trenching and excavated 3 cellars. You said 'try it and let us know how you like it' and this is *how*."

AMERICAN CABLE COMPANY, INCORPORATED
Grand Central Terminal Building, New York City
District Offices: Chicago, Detroit, Philadelphia, Pittsburgh, Tulsa, San Francisco
An Associate Company of the American Chain Company, *Incorporated*
Dominion Wire Rope Company, *Limited*, Montreal, Sole Canadian Licensed Manufacturers

PREFORMED WIRE ROPE

TRADE **TRU-LAY** MARK

(Reg. U. S. Pat. Off.)

When writing advertisers, please mention ROCK PRODUCTS

takes command

tons per hour of sand and gravel, washed separated and classified.

Because the two-cycle, airless injection F-M Diesel needs least in maintenance—demands no periodic valve grinding or re-timing, the "Admiral" is ready for low-cost, dependable operation that sand dredging at a profit requires.

Because her power plant is compact, the designers of the "Admiral" were able to put more dredging capacity on her hull. Her fuel capacity is enough to let her stay on location with re-fueling only once or twice a season. She is the last word in dredging efficiency—an efficiency made possible by low overall cost F-M Diesel power.

FAIRBANKS, MORSE & CO., CHICAGO

28 Branches Throughout the United States at Your Service

-MORSE ENGINES


And Now the
220th P&H
is Serving its Owner
HARNISCHFEGER CORPORATION
Established in 1884
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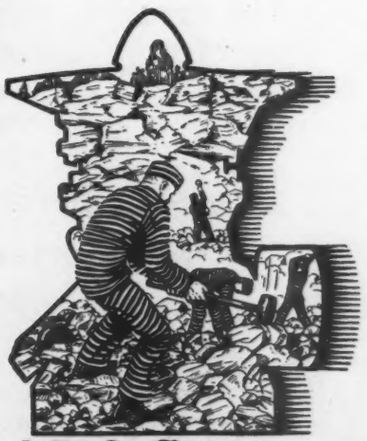
WAREHOUSES AND SERVICE STATIONS
Philadelphia, Memphis, Jacksonville, SanFrancisco, Los Angeles, Seattle
—and there are more P & H
Gasoline-Powered Excavators
in service than any other make.

TO THE ROCK PILE

—a tough sentence, and a hard job—but not for Austin Gyratory Crushers—they are built to stand the rack and strain of the hardest crushing job on the hardest rock pile—correctly designed from hopper to discharge spout, from spider to driver—gyratory action with ample power and capacity—rugged oversized parts — non-clogging — an Austin sentence to the rock pile never ends.

Austin Gyratory Crushers have crushing ability, plus stamina, to serve their full time—ask any user—be a witness—do not accept circumstantial evidence; write us today—get the facts NOW.



A Life Sentence

AUSTIN MANUFACTURING CO.

ESTABLISHED 1858

400 N. MICHIGAN AVE. CHICAGO

When writing advertisers, please mention ROCK PRODUCTS

Hayward Orange Peel Bucket taking stone from bins

Hayward Clam Shell Bucket serving Florida Portland Cement Co.

In Florida's $5,000,000 cement plant

THE huge new plant of the Florida Portland Cement Co. is located at Tampa, and has an initial capacity of no less than 1,500,000 barrels a year.

It is equipped throughout with machinery of modern type, and the work of handling materials is performed by Hayward Buckets.

The giant Hayward Orange Peel shown takes run-of-shovel rock from a bin, and dumps it into the hopper which feeds the roll crusher.

Two Hayward Clam Shell Buckets of 2½ cu. yd. capacity are used to carry raw product and clinker.

It pays plants like this to put Haywards on the job. It will pay you to talk over your plant needs with a Hayward engineer.

THE HAYWARD COMPANY

200-204 Fulton St. New York, N. Y.

Builders of Clam Shell, Orange Peel, Drag Line and Electric Motor Buckets; Dredging, Excavating, and Coal Handling Machinery; Automatic Take-Up Reels; Counterweight Drums.

Hayward Buckets

When writing advertisers, please mention ROCK PRODUCTS

This New Method~

MANY quarry operators have found by actual experience that two 1¼ yard gasoline shovels are more economical to operate than one shovel of twice that capacity—if they can stand the rough handling of quarry work.

The Lorain 75 stands up to the hardest quarry work — day after day, month after month because the Thew Center-Drive makes the Lorain 75 a different kind of machine. The astounding performance of the Lorain 75 on quarry work is selling Lorain 75s to the entire excavating field.

THEW CENTER DRIVE

Quick convertibility for crane or dragline service enables part of your equipment to be used for stripping, stock-piling or other work during slow production periods.

Thew and Thew only has the Center-Drive. Write to-day for information as to how Center-Drive can increase your production—and profits.

THEW SHOVEL COMPANY • LORAIN, OHIO

THEW

Gasoline or Electric Powered

LORAIN 60 AND 75

Shovels Cranes and Draglines

Storing Bulk Materials For A Cement Mill—at the Rate of 200 Tons Per Hour

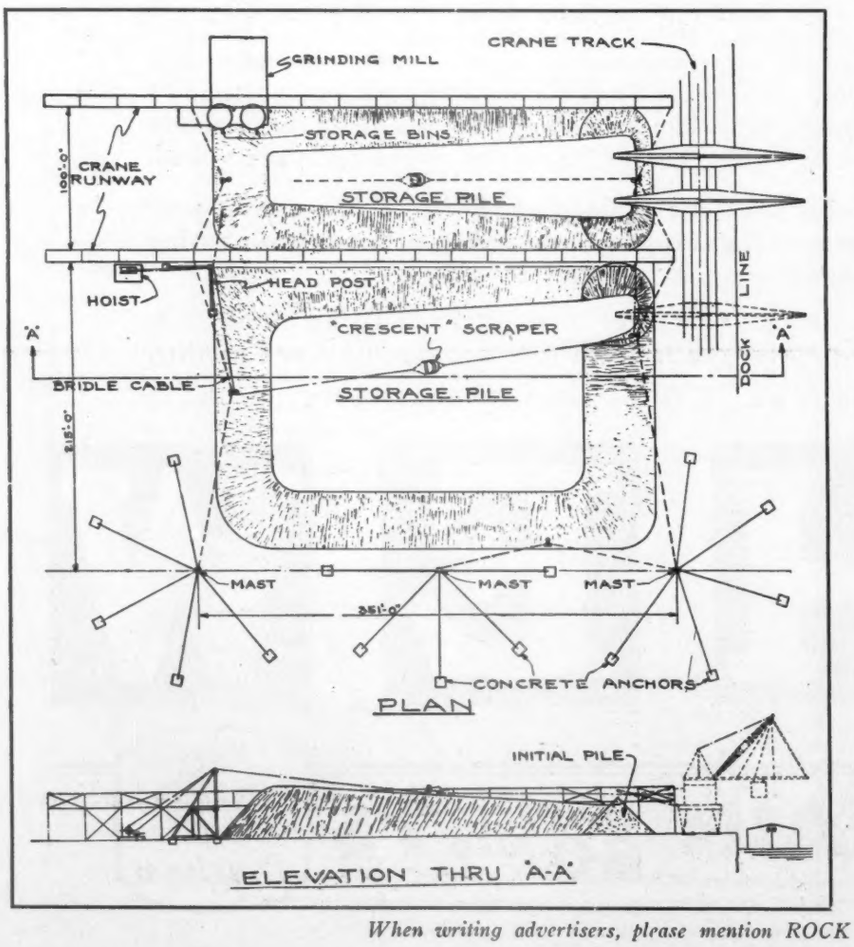
View at right shows the Sauerman Scraper "riding" its load over the pile to the farthest corner of storage yard.

A STEADY supply of stone for the mill was one of the chief problems confronting the Aetna Portland Cement Company, Bay City, Michigan, when they decided to eliminate costly shut-downs and delays.

They had to store for all year around production, and they had a peculiarly situated ground area for storage. What they were actively interested in, was finding the most economical and satisfactory means of storing between 100,000 and 120,000 tons of crushed stone.

Taut line cableways, conveyor belt systems and locomotive cranes were all considered and studied. They found, however, that a power scraper system would cost considerably less money to install—would cost less money to operate and maintain—and besides, was the type of equipment that could be installed and put into operation quickly.

The equipment as finally selected was a 3 cu. yd. Sauerman "Crescent" Power Drag Scraper. It stores the incoming supply of stone at the rate of 200 tons per hour—and when the mill must draw from storage, the "Crescent" Scraper simply is turned around and reclaims the stone from storage just as fast and just as economically.



The outstanding advantages of this Sauerman Power Scraper installation are its ability to store over the entire area available—the low labor cost (only one man is needed for operation)—the low fixed charges on stone in storage due to the economies of Sauerman equipment—the ease with which the scraper can be shifted from storing to reclaiming, and vice versa.

Check over how these advantages would lower your bulk handling hauling costs, and then write for the new 96-page scraper booklet that illustrates and describes over one hundred Sauerman scraper installations, showing how this equipment meets a wide range of conditions and requirements.

Send in your name and address on a common postal card—we'll mail the booklet.

Sauerman Brothers, Inc.
430 South Clinton Street
Chicago, Illinois

D. P. MacNEILL
TRUCKING SERVICE

Pontiac, Mich., Nov. 25, 1927.

Fate-Root-Heath Co.
Plymouth, Ohio.

Gentlemen:

I find my Plymouth Locomotive more than satisfactory

We are running it from 10 to 12 hours daily and have not had one minute's trouble with the mechanism. I was agreeably surprised with its economical operating cost and find that it has a surplus of power for all the loads which I have drawn.

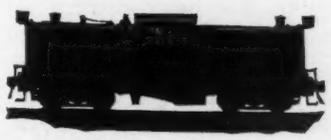
Very truly yours,

D. P. MacNeill.

"I find my Plymouth Locomotive more than Satisfactory" D.P.MacNeill

This eight ton Plymouth Gasoline Locomotive used by Mr. MacNeill at his gravel pit at Pontiac, Michigan, is working 10 to 12 hours per day hauling two 6 yd. cars loaded to 35 tons over a 2000 ft. track, having a grade of 5 per cent and 30 ft. radius curves. Six hundred cubic yards of gravel are hauled per day on a gasoline consumption of only 18 to 20 gallons.

This plant formerly operated a centrifugal pump arrangement for delivering the gravel. It was a track haulage *problem* but a Plymouth solved it.



50-TON DIESEL

Plymouth Gasoline and Diesel Locomotives are built in a full range of sizes from 2 to 50 tons. Designed to reduce fuel and operating costs to a minimum.

One Dominate purpose — To Build the Best Gasoline and Diesel Locomotives in the World.

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
PLYMOUTH, OHIO

PLYMOUTH
GASOLINE *Locomotives* DIESEL

A Longyear Job on a Limestone Property in Ohio.

Quarrying vs. Underground Mining

DESIRABLE stone with thin overburden is the first to be mined, usually by quarrying methods. When such deposits are exhausted, further enlargement of the property results in increased overburden, which may become so heavy that profitable open pit work is impossible. You are then faced with abandonment of the quarry, or the adoption of underground methods.

Not only does underground mining lower production costs where heavy overburden exists, but it is a means of controlling the purity of the product mined where clay pockets and seams are found in the open ledges. With stripping, it is impossible to prevent a small amount of clay, sand, or gravel becoming intermixed with good stone. This creates a difficult and expensive problem for clay and sand impurities usually associate with the fines and are frequent causes of rejection by the purchaser of fluxing stone. When working these same ledges by underground methods, areas containing sand and clay can be avoided and the stone produced free from foreign matter which will have an important bearing on its use. In properly conducted underground operations, fines are as clean and pure as lumps, resulting in a product for which there is a broadening market.

The Longyear Company, with its skilled mining organization, has demonstrated the value of underground mining in a large number of non-metallic operations. Our crews are experienced in shaft sinking, raising, tunnelling and mining, and are ready to handle such work for you under contract. We are equipped to examine your property, lay out a mining plan, if that method will reduce your costs, and start preliminary mining operations.

Without obligation, write us about your quarrying or mining problems.

E. J. Longyear Company
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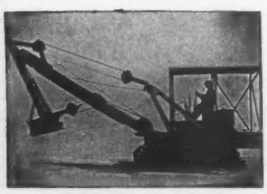
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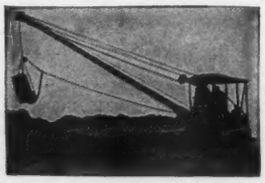
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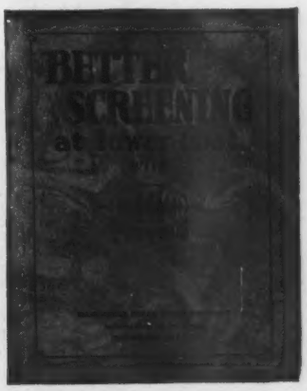

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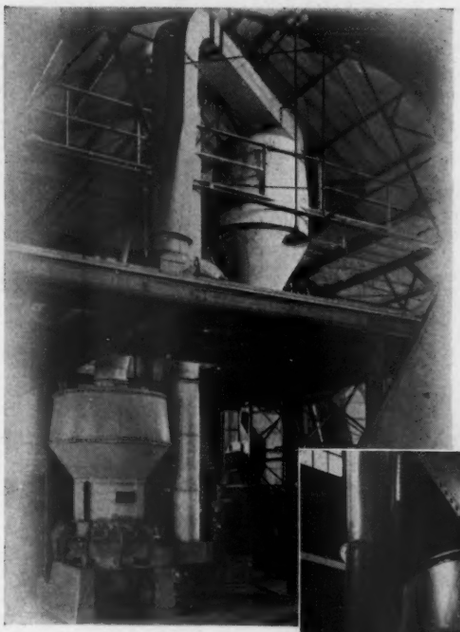
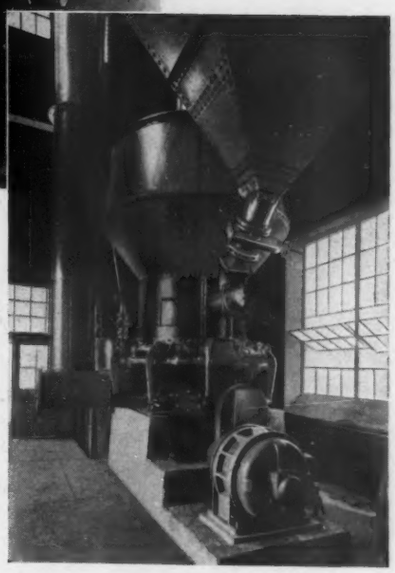
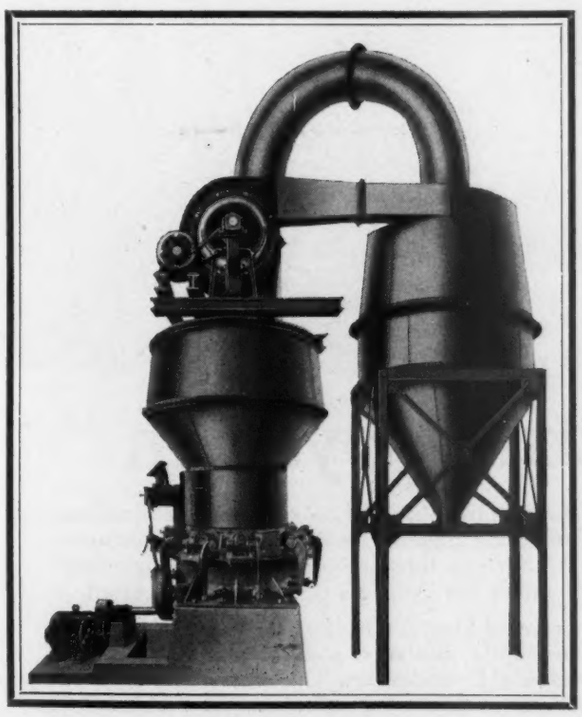


Left:

A Bethlehem Pulverizer installation in a Rock Products plant.



The above illustration shows a Bethlehem Pulverizer installed in a pulverized coal burning power plant.



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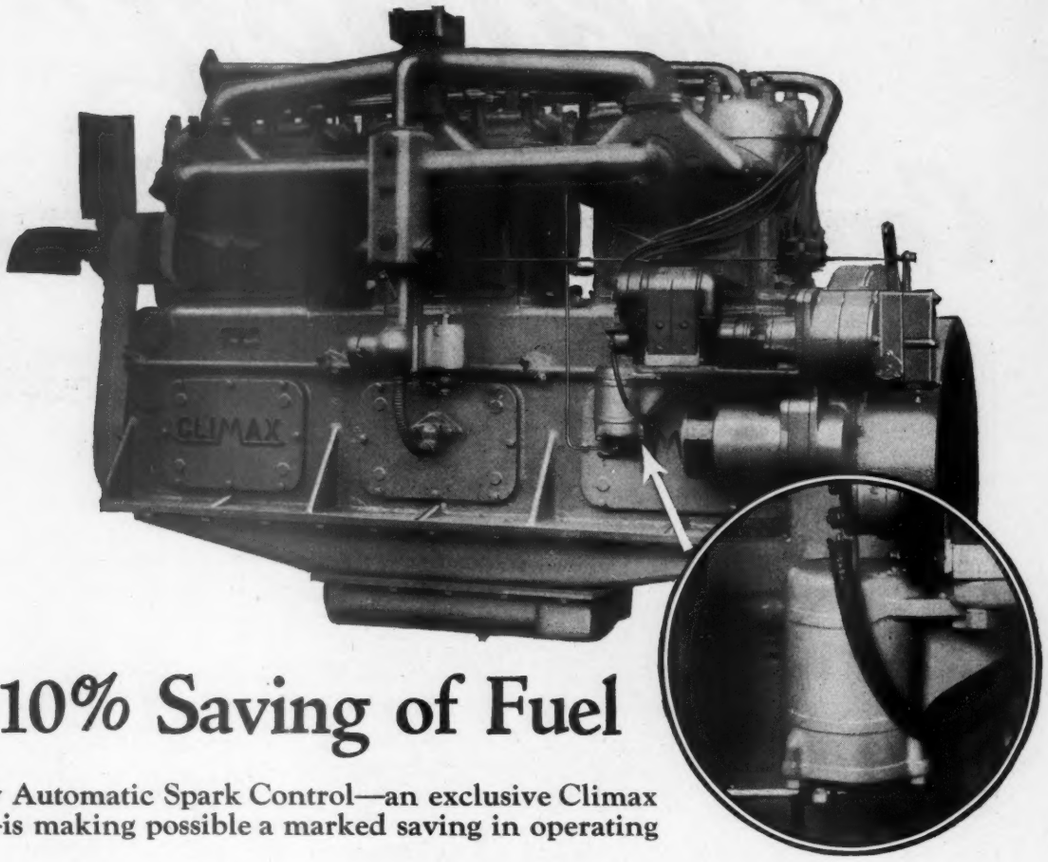

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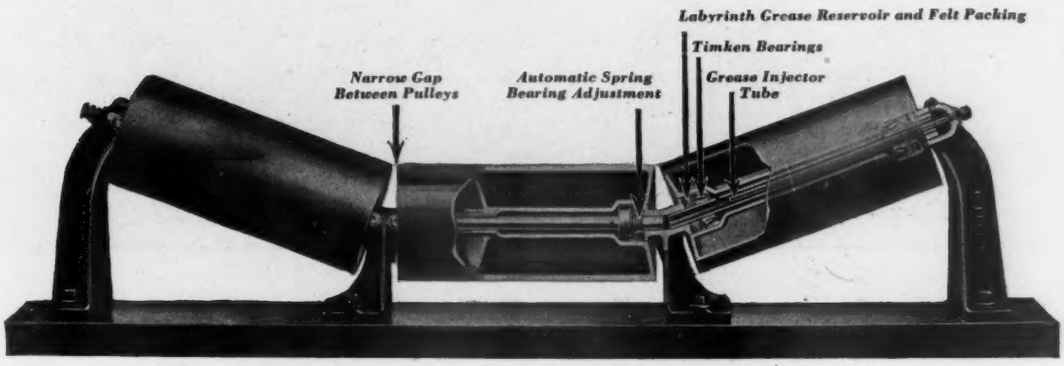

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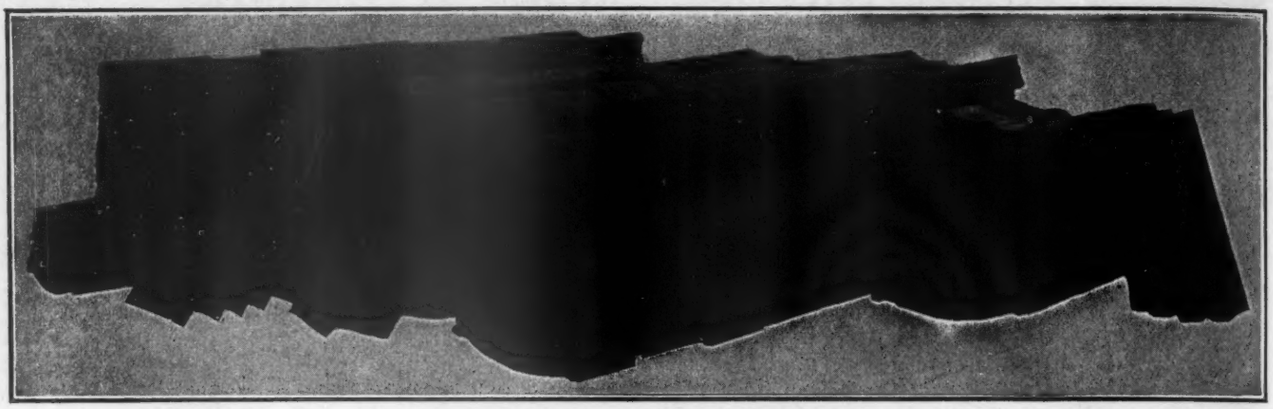

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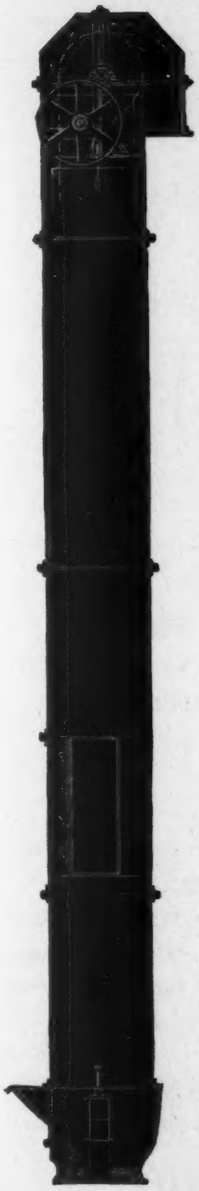

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The style of bucket selected for your elevators depends upon material handled and the design of the elevator. S-A Elevator Buckets range in style and size from tiny malleable iron buckets for handling grain and light materials up to huge steel buckets to handle big tonnages of rock and ore.

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Working for The Foundation Company of New York on the foundations of the 42 story Union Trust Co. building in Detroit, Mich., two Dobbie Full Rotating Derricks did the work of five or six of the ordinary stiff-leg type.

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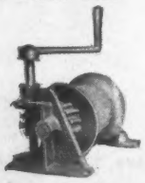

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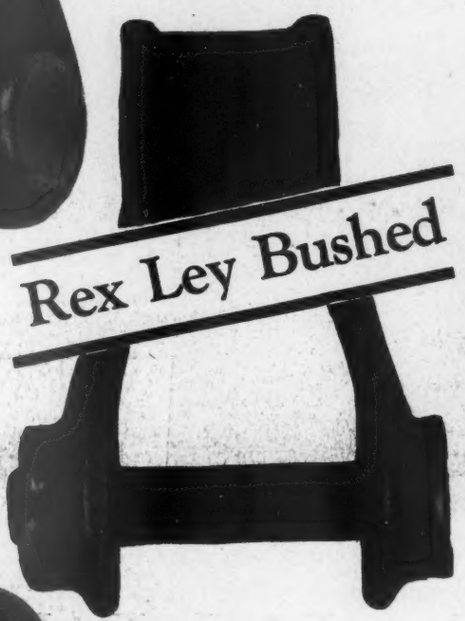

on Steel or Temperim Sprockets provides the hard smooth wearing surface of steel in the bushing and the alloy pin with the low cost of the malleable iron in the rest of the link, for heavy duty slow speed elevators.

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Volume XXXI | Chicago, March 17, 1928 | Number 6

What's Wrong in These Pictures?

What's wrong with this Pennsylvania quarry face?

Look Below

What's wrong with the concrete in the foreground? The coarse aggregate came from the quarry shown above!

Usefulness of Petrology in the Selection of Limestone*

Quarry Failures and Poor Concrete Could Have Been Avoided if the Mineral Composition and Texture of Stone Had Been Determined and Appreciated

By G. F. Loughlin

Geologist in Charge of Stone Investigations, U. S. Geological Survey

IN FEBRUARY, 1927, the writer presented a paper on the suitability of different kinds on stone for concrete aggregates before the American Concrete Institute.[1] Subsequent general interest in the subject resulted in the submission to him of several samples of stone suspected of being responsible for the disintegration of concrete in which they were used as coarse aggregate. These samples were submitted mainly by members of Committee C-9 (on concrete aggregates) of the American Society for Testing Materials, and the writer also had the privilege of examining two of the quarries from which these samples were taken. The results of their examination were presented before that committee at its annual meeting in June, 1927; but owing to the field duties which kept the writer in the west from July until November, a finished paper on the subject could not be submitted in time for inclusion in the committee's report. At the invitation of the editor of ROCK PRODUCTS, therefore, much of the information is presented here, but with the quarryman as well as the engineer in mind. It shows how some timely attention to petrology (the composition and mode of occurrence of stone) would have saved much money spent on misdirected quarrying and on chemical and physical tests that were not of critical significance.

Physical Tests Not Enough

Of the 24 samples submitted to the writer all but one were impure limestones, and those that proved to be unsound from the standpoint of weathering contained considerable quantities of clay material. This presence of clay is doubtless sufficient in the eyes of many to condemn the stones without resort to testing, but the fact that some of these stones were used only after a series of physical tests had been made with satisfactory results implies that their clayey character was not readily recognized by ordinary methods of inspection. Data are most complete for the two quarries examined, both of them in western Pennsylvania, and these will, therefore, be considered at some length.

The Allman quarry, not operated since 1919, is one mile south of Clarksville, Jefferson Township, Greene County, Pennsylvania. It is ideally situated in a bluff of horizontal strata close to a railroad, and it is most unfortunate that its stone is mostly of poor weathering quality. The writer visited this quarry in June, 1927, in company with H. S. Mattimore, engineer of materials, department of highways, Harrisburg, Penn., and P. J. Freeman, chief engineer, bureau of tests and specifications, Allegheny County Department of Public Works, Pittsburgh, Penn. A section of the lower ledges, furnished by Mr. Mattimore, together with results of physical tests, is given in Table 1.

All the samples represented in this table were designated argillaceous limestone of light gray color except No. 15, which was bluish gray. The presence of 29% of shale in this section is sufficient to cause suspicion, and when the amount of scaling or spalling due to frost action is noted on the limestone beds in the bluff close by the quarry, one who has paid much attention to the weathering of rocks would report the formation as a whole unfit for use; but the stone was evidently judged by the usual physical tests alone, and these gave generally favorable results. Specifications of the Pennsylvania State Highway Department require a crushing strength of at least 17,500 lb. per sq. in. for limestone to be used in cement concrete pavement, and all the samples tested exceeded this strength except one, and that was one of the five that passed the sodium sulphate test for soundness. All but one of the samples met the requirement of at least eight for the French coefficient of wear. Most of the standard railway specifications were also fulfilled in this respect. All the samples far exceeded the required crushing strength of at least 10,000 lb. per sq. in. and the required toughness of at least 7. Only the tests for absorption gave cause for suspicion, as only five of the nine samples had a ratio of absorption less than the allowed maximum of 2.20 lb. per cu. ft.; but two of the remaining four samples passed the sodium sulphate test.

Presence of Shale Arouses Suspicion

In 1919 the stone was being used in concrete pavement on the Jefferson road, Greene County, Penn., when it was first seen by Mr. Mattimore, who had just joined the Pennsylvania Department of Highways. Its appearance aroused his suspicions, and after an examination of the quarry he recommended that the stone be condemned. Three years later the concrete pavement containing the stone began to disintegrate appreciably, and the writer's inspection of the road and quarry in 1927 confirmed Mr. Mattimore's conclusion that the disintegration was due to the stone. Much of the stone showed no visible effects of weathering after an exposure of six to seven years, but many of the fragments had "burst" by the development of roughly concentric and transverse cracks. Where only one fragment had "burst" the cement matrix had been pried off, leaving an isolated pit in the concrete similar to pits

Editors' Note

IMPURE—argillaceous—limestones may be good cement rock, but they may make poor aggregates for concrete because clay in certain forms is undesirable.

Physical tests—crushing strength, coefficient of wear, hardness, etc., —are not always sufficient to determine the lasting qualities of a stone.

"A stitch in time saves nine." A few hundred dollars spent for a geologist's advice before opening a quarry may save several hundred thousand dollars loss later on.

The days of "hit or miss" in the commercial quarry industry are about over. There will soon be a market for all of the knowledge available about stone.

The intelligent crushed-stone producer of a quality product has everything to gain and nothing to lose by development of such facts as given here. But there are various measures of quality, depending much on geographic location.—The Editors.

*Published by permission of the Director of the U. S. Geological Survey.

[1]Loughlin, G. F. Qualifications of different kinds of natural stone for concrete aggregates: Proc. Amer. Concrete Institute, Vol. 23, pp. 319-354. 1927.

formed by the "popping" of poorly hydrated lime plaster; but where several fragments had burst within a small area, the concrete became filled with small cracks that readily admitted water and accelerated disintegration by frost action. Advanced disintegration of the pavement is shown in Figs. 1 and 2, and slightly developed to advanced disintegration of a retaining wall along the road is shown in Figs. 3 and 4 (frontispiece).

Examination of the quarry showed that all of the beds exposed in the quarry face since the quarry was abandoned in 1919 had been cracked to some degree by frost action, and that some had disintegrated considerably (Figs. 5 and 6 (frontispiece)). Rough blocks on the quarry floor showed varying degrees of disintegration. Some contained only a few cracks due to bursting by frost and some were thoroughly reduced to small fragments and powder.

Mr. Freeman had previously inspected the quarry in May, 1926, and broken three samples from blocks about 1 cu. ft. in size; one of "sound" stone appeared to be still in perfect condition after exposure from 1919 to 1926; one of "unsound" stone that could be readily broken; and one of "bad" stone that was still more disintegrated. These were subjected to the sodium sulphate test with the following results: the "sound" stone cracked along certain planes on the fifth treatment, the "unsound" stone completely failed on the third treatment, and the "bad" stone completely failed on the first treatment. These failures doubtless took place much more quickly than they would if the stone had not already been exposed for six winters; but they agree with the results of actual use in showing what is to be expected of such a stone after a few years of use in a concrete pavement that is continually in contact with moist ground and repeatedly subjected to freezing temperatures.

Fig. 1. Section of the Jefferson road, Greene County, Penn., showing in foreground disintegrated concrete pavement after six years of exposure. In part repaired with asphaltic patches. The coarse aggregate, from the Allman quarry near Clarksville, Green County, is the cause of the disintegration. The sound pavement in the middle and background contains a different aggregate. (Photo furnished by H. S. Mattimore)

Fig. 2. View at close range of thoroughly disintegrated concrete pavement shown in Fig. 1. (Photo furnished by H. S. Mattimore)

Examination of Samples

Specimens of these three samples were submitted to the writer for examination. They are all brownish gray and microgranular, and have an average content of about 25% of insoluble impurities, but differ somewhat in the ratio of impurities to one another, and markedly in porosity. Partial chemical analyses were made of the "sound" and "bad" samples. The "sound" sample contains 27.36% of insoluble material and 1.30% of water, whereas the "bad" sample contains only 22.42% of insoluble material but 1.35% of water. Microscopic examina-

TABLE 1.—SECTION OF ALLMAN QUARRY (DECEMBER 3, 1920) WITH RESULTS OF PHYSICAL TESTS MADE BY PITTSBURGH TESTING LABORATORY

Laboratory No.	No.	Stratum	Thickness in feet	Specific gravity	Weight per cu. ft.	Absorption lb./cu. ft.	Absorption Per cent	Per cent of wear	French coefficient of wear	Crushing strength lb. per sq. in.	Toughness	Slaking or sodium sulphate test
6—72	17	"Pink cast" limestone	8.0	2.56	159.7	3.99	2.5	2.2	13.6	24,726	16	Sound
	16	Shale with thin limestone layers	9.0	.....	.....	.....	....	....	.....	.....	....	.....
6—80	15	Limestone	1.3	2.65	165.4	1.07	.64	4.0	10.0	18,305	14	Sound
	14	Shale	0.5	.....	.....	.....	....	....	.....	.....	....	.....
6—71	13	Limestone	4.0	2.63	164.1	2.13	1.3	3.5	11.4	18,802	15	Fails
	12	Shale	3.0	.....	.....	.....	....	....	.....	.....	....	.....
6—81	11	Limestone	5.0	2.57	160.4	2.40	1.5	5.6	7.1	.....	17	Fails
	10	Shale	0.3	.....	162.9	2.25	1.4	3.3	12.1	21,963	17	Fails
6—74	9	Limestone	1.5	2.61	.....	.....	....	....	.....	.....	....	.....
	8	Shale	0.8	.....	.....	.....	....	....	.....	.....	....	.....
6—70	7	Limestone	1.2	2.65	165.4	2.15	1.3	3.8	10.5	18,691	22	Sound
	6	Shale	0.5	.....	.....	.....	....	....	.....	.....	....	.....
6—79	5	Limestone* (Shale parting)†	2.7	2.55	159.1	3.82	2.4	5.0	8.0	13,038	10	Sound
6—78	3	Limestone	2.0	2.57	160.4	1.60	1.0	4.2	9.5	16,615	15	Fails
	2	Limestone (Shale parting)	3.0	.....	.....	.....	....	....	.....	.....	....	.....
6—73	1	Limestone‡	3.0	2.68	167.2	1.07	.64	3.4	11.5	20,118	26	Sound

*Elevation of main bench. †Elevation of crushing platform. ‡Elevation of engine base.

tion by C. S. Ross of the U. S. Geological Survey proved that the insoluble material consisted almost entirely of finely divided quartz and one or more clay minerals resembling beidellite,[2] which contained the water. The insoluble part of the "bad" sample therefore contained a slightly greater proportion of the clay mineral, but it was not so much this difference in relative quantity as the distribution of the clay particles and the difference in porosity (1.9% for the "sound" and 4.5% for the "bad" sample) that accounted for the difference of durability.

The clay is evenly distributed in the "sound" sample, which breaks with a smooth conchoidal fracture, but it is partly segregated in the "bad" sample into inconspicuous films parallel to the bedding (Fig. 7), so that the stone has a very uneven fracture. Even when the "bad" stone is broken perpendicular to the bedding the fracture is repeatedly deflected for short distances along inconspicuous bedding planes that are coated with films of clay. Where the clay is most concentrated minute cracks have formed, and account largely for the greater porosity of the sample. Microscopic examination shows that in both samples the clay forms films around the grains of calcite and quartz and also around minute fragments of fossil shells, and thereby lessening the cohesive strength of the stone, especially if it has been kept in a moist condition.

[2]Study of clay minerals is disclosing an increasing number of species that can be distinguished only by thorough microscopic and chemical analyses of practically pure material. The different species are alike in their property of readily adsorbing or giving up water which is the most critical property from the standpoint of weathering, and is typically demonstrated by the species, beidellite and montmorillonite.

Fig. 3. Concrete retaining wall along Jefferson road, Greene County, Penn., showing the beginning of disintegration expressed by "pop" holes due to the bursting of pieces of coarse aggregate from the Allman quarry. (Photo by Allegheny County Department of Public Works)

Factors Determining the Resistance of Stone to Freezing

Had the "sound" sample been examined before any tests for soundness had been made it would have been regarded with suspicion, because of its large content of clay films around the grains and because of its appreciable porosity. The fact that it cracked on the fifth treatment with sodium sulphate justifies the suspicion; but in Table No. 1, the percentages of absorption, which usually do not fully represent the true porosity, show no sharp distinction between sound and unsound samples. Samples Nos. 1 and 15 are distinctly less porous than the others, but there is little or no difference between the sound sample No. 7 and the unsound samples No. 9, No. 11 and No. 13. On the other hand, the unsound sample, No. 3, with only 1% absorption, is distinctly less absorptive than No. 7. Samples Nos. 5 and 17, both rated as sound, have higher absorptions than any of the unsound samples, and it was not surprising to see that these beds had scaled and cracked appreciably during their six years of exposure in the quarry face. It must be concluded that the percentage of absorption, although suggestive, is not a definite criterion for determining the weathering quality of the stone. Obviously impervious stone is less subject to injury by freezing than porous stone, but stone with as little as 1% absorption may or may not be injured. It is the presence of clay minerals that are affected by absorbed water rather than the actual amount of pore space that determines the resistance of the stone to freezing.

Quarry in Westmoreland County, Pennsylvania

The other quarry examined is in Westmoreland County, Pennsylvania, and will be referred to for convenience as the "West-

Fig. 5. North end of Allman quarry, near Clarksville, Greene County, Penn., showing disintegration of different limestone beds. Not one bed in the view is entirely free from injury by freezing. Some beds are reduced to small scaly fragments and are unfit for use under any circumstances in concrete that is to be exposed to the weather; others show small to considerable amounts of cracking or "bursting," and crushed stone from them might be suitable for use after adequate seasoning. The interbedding of the better and poorer stone and the large proportion of the poorer stone preclude economical quarrying. (Photo by Alleghany County Department of Public Works)

moreland County" quarry. A section of the quarry, as measured by Mr. Freeman, is shown with the results of certain physical tests in Table 2.

This quarry is a recent opening intended evidently as a further development of stone that had already been successfully quarried. At the original quarry (Fig. 8) a limestone of good quality, 3 or 4 ft. thick, and dipping at a very small angle, practically coincided with the surface of a low hill, and could be worked with very little stripping; but the writer is informed that rigid inspection was necessary to eliminate shaly rock that lay just above and below the good stone, and perhaps forming local partings within it. Pits sunk below this good bed exposed only stone of poor quality which rapidly weathered to a rusty brown, and the quarry had to be abandoned when the one good bed was exhausted.

The new quarry (Fig. 9) was opened a short distance from the old one, at a place where the dip of the bed formerly quarried had carried it 40 ft. below the surface. The new opening exposed an overburden of 18 ft. and a 22-ft. thickness of limestone that evidently looked satisfactory when first exposed, except for a few shale partings. The writer is informed that costs and conditions of operation were investigated and found satisfactory, but that investigation of the weathering qualities of the different limestone beds was neglected, until after considerable equipment had been purchased and put in operation. Then Mr. Freeman, interested in the purchase of crushed stone for concrete roads in Allegheny County, Pennsylvania, had samples of different beds subjected to the sodium sulphate test, with the results shown in the accompanying table. (Table No. 2.)

Fig. 7. Photomicropgraph of "bad" stone from Allman quarry. Note the dark lenticular streaks where clay resembling beidellite and organic matter are more concentrated than elsewhere, and along which the stone has developed minute cracks. Magnification, 30 diameters

Mr. Freeman submitted specimens from 10 of these samples to the writer. Three of them, A, C and D, marked "sound," were dark gray with a slight brownish tinge. The brownish tinge, as in sample from the Allman quarry, was due to oxidation of a small amount of iron carbonate in stone that was originally blue or bluish gray. The three specimens were uniformly dense or microgranular, and broke with a conchoidal fracture (Fig. 10). Their percentage of absorption, according to data submitted by Mr. Freeman, ranged from 0.04 for C and D to 0.11 for A, and the porosity of sample A, determined by J. G. Fairchild of the U. S. Geological Survey, was 0.14%. Sample A contained 13.63% of insoluble residue, more than two-thirds of which consisted of microscopic quartz with a little feldspar and mica. Clay material formed less than one-third. The grains in the insoluble residue are 0.01 mm. or less in diameter, but the smallest of them are much larger than the small grains in the unsound samples, and have a correspondingly smaller tendency to absorb and retain water.

The six unsound samples received from Mr. Freeman (E to J) were all from different parts of Bed No. 7. All were light gray and of relatively dull luster, except where obscure cleavage faces of calcite were present. Their fractures range from rather con-

TABLE 2.—SECTION OF LIMESTONE QUARRY IN WESTMORELAND COUNTY (1926) WITH RESULTS OF CERTAIN PHYSICAL TESTS

Laboratory symbol	No.	Stratum	Thickness		Absorption lb./cu.ft.	Absorption Pct.	Porosity	Slaking or sodium sulphate test
	15	Overburden of clay, shale and limestone.						
		Gray limestone	18 ft. 0 in.					
M	14	Yellow to bluish white	2 ft. 6 in.	22 ft. 6 in.	.....	7.86	.....	Failed
L	13	Same as 14	2 ft. 0 in.		.....	.....	.....	Failed
		Shale parting						
	12	Grayish blue	1 ft. 8 in.		.....	.....	.....	Sound
	11	Gray with blue tint	1 tt. 1 in.		.....	.....	.....	Sound
	10	Grayish blue	1 ft. 3 in.	5 ft. 9 in.	.....	.....	.....	Sound
		Shale parting						
	6	Mottled gray-blue	0 ft. 9 in.		.....	.....	.....	Sound
K	8	Grayish blue	1 ft. 0 in.		.....	.30	.....	Sound
E to J	7	Very light gray at top; dark blue at bottom	3 ft. 0 in.	3 ft. 0 in.	.....	2.19–4.73	(E)2.5	6 samples failed after 3 to 5 treatments
D	6	Bluish gray at top	2 ft. 4 in.	3 ft. 10 in.	.....	.04	.....	Sound
C	5	Bluish gray	1 ft. 6 in.		.....	.04	.....	Sound
	4	Blue shaly	?		.....	.30?	.....	Failed
	3	Blue shaly	?		.....	.....	.....	Failed
		Shale parting						
B	2	Blue	2 ft. 3 in.	3 ft. 9 in.	.....	.....	.....	Sound
A	1	Dark blue	1 ft. 6 in.		.....	.11	.14	Sound

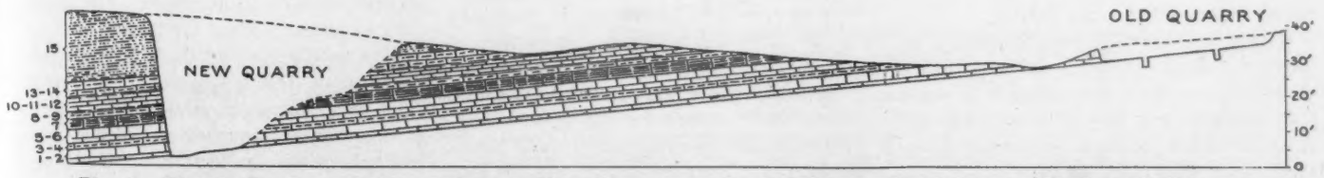


Fig. 8. Sketch showing relations between old and new quarries in Westmoreland County. Horizontal distance not drawn to scale. Beds of sound stone are numbered to correspond with accompanying table No. 2

Fig. 9. Part of limestone quarry in Westmoreland County, Penn., showing alternating beds of sound and unsound stone. Injury to the unsound beds is much less conspicuous than in the Allman quarry. Bed No. 7 is too poorly exposed to show the beginnings of disintegration, which are distinct only on close inspection. Beds Nos. 8 and 9, though sound according to the sodium sulphate test, are so intimately mixed with streaks of shale that they cannot be quarried. (Photo by Alleghany County Department of Public Works)

choidal to uneven, but even the more conchoidal surfaces are much rougher than those of the sound samples. The uneven surfaces (Fig. 11) show a distinct though not extreme tendency to deflect along obscure bedding planes and small fractures. One of them (Sample J) contains crystals of calcite up to an inch in diameter, in which the insoluble material is so uniformly inclosed that the crystals are very obscure. One fragment of this sample, when immersed in dilute hydrochloric acid, split along one of these crystals, which bordered a partly cemented crack. Such a crack would be readily opened by freezing water or crystallizing sodium sulphate, and would give a bad impression of otherwise good stone. Examination of Bed No. 7 in the quarry, however, and of blocks from it on the quarry floor, showed a considerable amount of cracking, scaling and crumbling due to the freezing of stone that had not been previously fractured.

Causes of Failure

The percentages of absorption of the six unsound samples ranged from 2.19% to 4.73%, but did not vary directly with the number of sodium sulphate treatments necessary to cause failure. It therefore appears that the number of permeable bedding planes and fractures rather than true porosity was mainly responsible for the failures.

Sample E, which failed with the third treatment of sodium sulphate, contained 12.27% of insoluble material and only 0.50% water, both somewhat less than in the sound sample A. Microscopic examination showed its insoluble part to contain the same minerals as sample A, but with an excess of clay mineral resembling beidellite. Next to this mineral the most abundant mineral was chalcedony, a form of silica, which had partly indurated the clay and thereby diminished its tendency to disintegrate. On the whole, the impression is gained that the light gray bed No. 7, though clearly inferior to the dark gray sound beds, owes its failure to obscure, closely spaced bedding planes and small cracks more than to its mineral composition.

If it were practical to crush the stone in Bed No. 7, and perhaps Beds No. 13 and No. 14 also, and spread the crushed product

Fig. 10. Specimen representing sample D (sound stone) from Westmoreland County quarry. Note the smooth choncoidal fracture. (Natural size)

in a thin layer to be exposed to the weather for a year or two, it would not be surprising to find that a considerable proportion of these beds could resist weathering satisfactorily; but without such selective treatment, the use of these beds for aggregate in concrete roads and retaining walls would be unsatisfactory. If present practices in the construction of buildings and roads permitted the use of stone from this quarry in concrete that was to be protected from the weather, for example, in partitions and floors, the stone would be satisfactory. Again, if it were economical to work the quarry in benches, whereby the sound stone could be separated from the rest, it might be possible to use the sound stone in concrete for roads and other exposed structures, and the unsound stone for structures protected from the weather; but if satisfactory quarry-run material can be obtained elsewhere at reasonable cost, there is no inducement to work a deposit that requires selective quarrying.

Samples of Stone from Other States

Samples of limestone, known to be or suspected of being unsound, were received from places in Illinois, Iowa and Kansas. All were found to contain considerable clay mineral similar in properties to that in the two

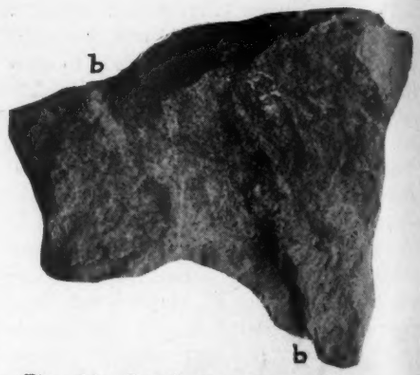


Fig. 11. Specimen representing sample J (unsound stone) from Westmoreland County quarry. Note the uneven fracture and its deflection along an obscure bedding plane (b) natural size

stones already described, and to have moderate to high porosity, and some had a pronounced shaly structure. Brief descriptions of them follow:

Illinois.—One sample, submitted by A. E. Stoddard[3] from an undeveloped deposit overlying a coal stratum in Perry County, Ill., is a dark blue limestone with a dull, uneven fracture surface, and containing 41% of insoluble material. The amount of insoluble material is so great that the leaching out of the lime carbonate with dilute hydrochloric acid results in very little disintegration and leaves a soft, porous mass. The arrangement of the insoluble material in a thin section from which the lime carbonate has been leached is shown in Fig. 12. Microscopic examination of the insoluble material shows it to be a mixture of very fine sand and clay mineral similar to beidellite. The average size of grain is about 0.005 mm., which together with a porosity of 3.3% implies that moisture is readily absorbed and retained. The stone, therefore, is not likely to resist frost action and certainly should not be considered for use, at least until the ledge or

[3]Assistant engineer of materials, Illinois Department of Public Works and Buildings, Division of Highways, Springfield, Ill.

stone broken from it have been exposed to weathering for one winter or longer. Four pieces of this stone without visible shaly structure were exposed to natural weathering conditions at Washington, D. C., in June, 1927, and by February 1, 1928, two of them had cracked.

Iowa.—Two samples of crushed limestone from a ledge near Buffalo, Iowa, were also submitted by Mr. Stoddard, who stated that some of the concrete roads containing this stone had shown little disintegration. One of these samples was of light gray dense stone that broke with a conchoidal fracture, contained relatively little insoluble material and appeared adequately resistant to weathering. Some fragments in it, however, contained small cracks due to natural shattering, which might promote frost action. If shattering is not prevalent in the quarry the proportion of fragments with shatter cracks may be too small to cause concern; if shattering is sufficiently prevalent, it may be worth while to consider the feasibility of crushing the shattered stone to fine sizes too small to contain the shatter cracks.

Fig. 13. Thin bedded limestone from a quarry in Iowa. Shaly partings at ton and bottom and along crack in middle of specimen, fossil fragments coated by films of clay, resembling beidellite, and part of the stone lower its resistance to weathering. the considerable quantity of clay in the massive (Natural size. Photo by U. S. Geological Survey)

The other sample from this quarry varied from medium to dark gray, broke with a dull, rough fracture, and with a considerable proportion of rather flat fragments. The flat fragments imply that a considerable part of the ledge has shaly partings or weak bedding planes. Close inspection showed obscure to distinct shaly films in some fragments, obscure cracks in a few others, and a few small fossil shells that are readily removed from the stone. A few fragments approach those of the other sample in character and appear to have satisfactory weathering properties, but the darkest fragments resemble those in the sample from Illinois, described above, and microscopic examination shows that their insoluble material consists mainly of clay with a little quartz in grains from 0.01 to 0.03 mm. in diameter. These and any of the medium gray fragments that contain shaly partings and weak bedding planes evidently account for the disintegration in concrete containing this stone.

Another sample from Iowa (exact locality not named) was submitted by R. W. Crum,[4] who stated that the stone had been found unsound according to the sodium sulphate test, and that some concrete containing it was disintegrating. The stone as a whole (Fig. 13) is of a very argillaceous limestone with many shaly partings, although some of the thin layers of limestone between the partings may be much less argilleaceous than the average. Fractures across these layers are deflected along closely spaced and almost invisible bedding planes. When the stone has been slightly leached by weathering, these bedding planes are made more conspicuous by films of clay that become slippery when wet. Fossil shells are conspicuous throughout the rock. They retain some of their original chitinous skins and are coated with almost invisible films of clay which cause the rock to break around rather than through them. Small, natural cracks across the bedding also contain films of clay. Microscopic examination shows that the abundant insoluble residue consists almost entirely of clay mineral and the distribution of this mineral in films along bedding planes and fractures and around fossil shells readily accounts for the poor weathering quality of the stone. Microscopic and chemical analyses show the clay mineral to be an unnamed species more closely related to montmorillonite than beidellite, but similar to both of these minerals in its adsorptive powers.[5] The chemical analysis is as follows:

CHEMICAL ANALYSIS OF IOWA LIMESTONE

Chemical Composition	Per Cent
Silica (SiO_2)	61.70
Alumina (Al_2O_3)	17.75
Ferric oxide (Fe_2O_3)	3.52
Ferrous oxide (FeO)	Not determined
Magnesia (MgO)	2.71
Lime (CaO)	Trace?
Soda (Na_2O)	0.32
Potash (K_2O)	6.66
Water (H_2O):	
Below 110 deg. C.	1.18
Above 110 deg. C.	5.24
Titanium oxide (TiO_2)	0.75
	99.83

The readiness with which the stone containing this mineral gains and loses moisture with changing humidity is expressed by the

[4]Engineer, materials and tests, Iowa State Highway Commission, Ames, Iowa.

[5]Microscopic study by C. S. Ross and chemical analysis by J. G. Fairchild, both of the U. S. Geological Survey.

Fig. 12. Photomicrograph of impure limestone from Perry County, Ill. The calcite mostly in the form of shell fragments, has been dissolved by dilute hydrochloric acid, leaving the insoluble material in its original position. The large white areas mark the former presence of calcite. The small light gray angular grains are mostly quartz with a little feldspar. The jet black grains are pyrite of iron oxide derived from pyrite, and the dark gray fine felty material is mainly beidellite. The short linear aggregates of the "beidellite," and the manner in which some of them coat the larger calcite grains indicate a low resistance to freezing. (Photo by U. S. Geological Survey. Magnification 160 diameters)

following comparative figures:

Loss of weight of limestone containing clay at 110 deg. C.	0.16%
Loss of weight of pure limestone at 110 deg. C.	0.02%
Gain of weight of limestone containing clay at 75% humidity	0.39%
Gain of weight of pure limestone at 75% humidity	0.08%

The strain on the rock due to such superficial alternating gains and losses of moisture is doubtless inappreciable for a long time, but the opportunity for rapid disintegration by frost action where the stone is in contact with humid ground is obvious. A typical specimen of this stone exposed to natural weathering at Washington, D. C., since June, 1927, had developed a few conspicuous cracks along bedding planes and around fossil shells by February 1, 1928.

Kansas Limestones

Kansas.—Six samples of argillaceous limestone from a quarry in Butler County, Kansas, were submitted by C. H. Scholer.[6] This stone, according to Mr. Scholer, had been used in bridge piers that had weathered considerably in periods of 5 to 10 years, and stone represented by each of the samples had failed in the sodium sulphate test. Cylinders of 1:2:3½ concrete representing samples were subjected by Mr. Scholer to 40 reversals of freezing and thawing, with the results shown in Fig. 14. The two pairs of cylinders at each end of the figure contain light gray to buff stone and have been very little affected, whereas the other four cylinders which contain dark bluish gray stone have disintegrated considerably.

[6]Engineer of Tests, Kansas Highway Commission, Manhattan, Kan.

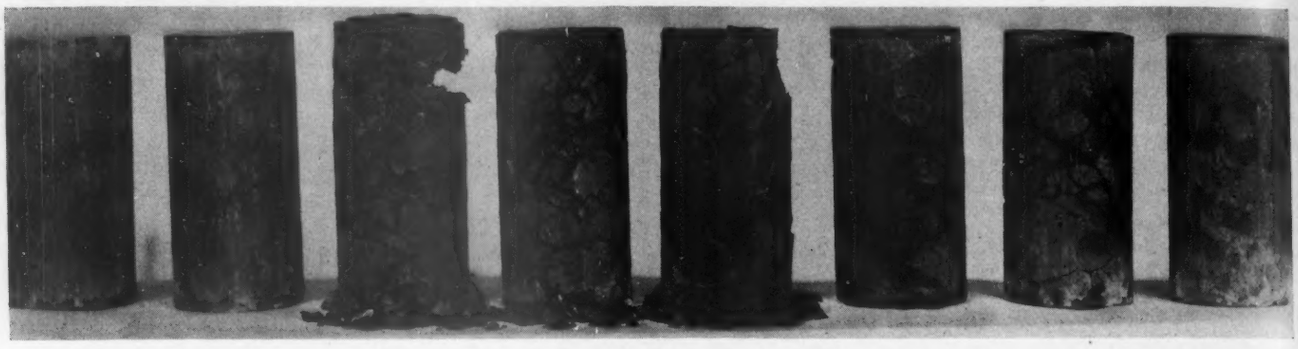


Fig. 14. Row of 3x6-in. concrete cylinders (1:2:3 1/2 mix) after 40 reversals of freezing and thawing. The coarse aggregate was from a limestone quarry in Butler County, Kans. The two cylinders at each end, which show comparatively little injury, contain the light gray stone from beds Nos. 1 to 4; the four middle cylinders which are considerably disintegrated contain the dark gray stone from beds Nos. 5 and 6. (Photos supplied by C. H. Scholer)

A section of the quarry submitted by Mr. Scholer is as follows:

SECTION OF A QUARRY IN BUTLER COUNTY, KANSAS

	Thickness
Overburden	6 to 8 ft.
No. 1. Light gray or buff with closely spaced bedding planes	2 ft.
Shale	3 in.
No. 2. Light gray or buff without conspicuous bedding planes	3 ft.
No. 3. Light gray or buff without conspicuous bedding planes	3 ft.
No. 4. Light gray or buff, finely banded, resembling shale but more massive	5 ft.
No. 5. Dark bluish gray, changing abruptly to light gray (or buff) in places	7 ft.
No. 6. Dark bluish gray, changing in places to light gray or buff	18 ft.

The difference in color is due to oxidation. The four upper beds, of light gray to buff color, have been above the level of ground water long enough for the dark carbonaceous coloring matter to be completely removed by oxidation, whereas the dark blue stone in the two lowest beds has been unaffected, except locally, where they too have been bleached to the light buff color. It is very improbable that this loss of carbonaceous matter has any appreciable influence on the durability of the stone, although it is conceivable that the finely divided carbonaceous matter may have aided in retaining moisture. Percolating water, which caused this oxidation, doubtless leached a minute quantity of lime carbonate from the rock, thereby enlarging the pores of the rock and rendering them less likely to retain moisture; but these changes are of minor significance and the main difference in weathering quality between the light and dark stones of this quarry is the originally higher degree of porosity and the greater proportion of extremely fine pores in the dark stone. In other quarries, dark, unoxidized stone may happen to be much less porous than the light, oxidized stone above it.

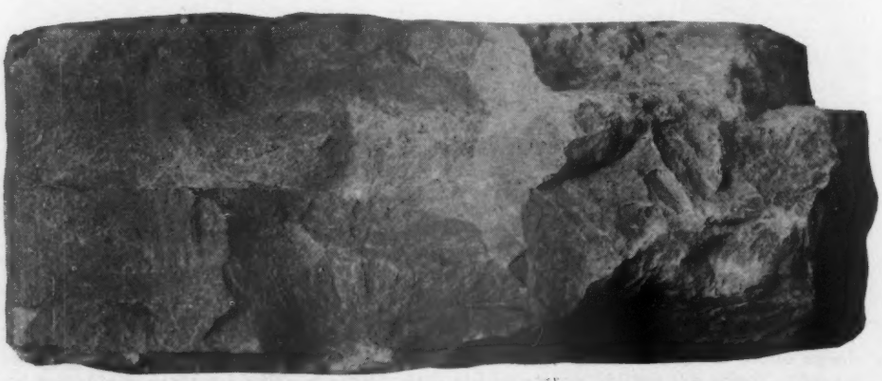


Fig. 15. Specimen from Bed No. 1 of a quarry in Butler County, Kans. Note the rather rough though somewhat choncoidal fracture, and the deflection of fractured surfaces along bedding planes, which are too closely spaced to insure resistance to weathering. (Natural size. Photo by U. S. Geological Survey)

Microscopic and chemical examinations show that samples Nos. 1 to 4 are very similar in their contents of insoluble material (7.2 to 9.5%), although Nos. 1 (Fig. 15) and 4 show bedding more distinctly than Nos. 2 and 3. No. 5, in contrast to these, contains 19.8% of insoluble material. The insoluble material in all five samples consists of about 40% fine, sandy grains (quartz, feldspar, and mica), averaging 0.015 mm. in diameter, and 60% clay mineral similar to beidellite. No. 6, with 10% of insoluble material, contains a greater proportion of the sandy grains, but is nevertheless more subject to disintegration than Nos. 1 to 4, owing to its larger control of minute pores. Porosity was determined as follows:

Sample No.	1	4	5	6
Percentage of porosity	2.2	5.9	5.8	7.9

From available data there is no appreciable difference between Nos. 4 and 5 either in mineral composition or porosity, but No. 4 is more distinctly shaly, which should tend to lower its weathering quality as compared with No. 5. The superior quality of Nos. 1

to 4, as a whole, over Nos. 5 and 6 would probably be more marked if No. 4 had been eliminated. Even the buff stone as a whole, however, in view of its porosity and content of beidellite, cannot be recommended for use in concrete roads, unless first subjected to the slow process of seasoning mentioned in connection with the stone of Westmoreland County, Penn. Specimens representing beds Nos. 1, 2, 4, 5 and 6 were exposed to natural weathering at Washington, D. C., in June 1927, and by February 1, 1928, all showed a slight amount of crumbling or minute scaling, and No. 6 had split along two inconspicuous bedding planes which passed from buff into blue stone.

Interpretation of Test and Other Data in the Light of Petrology

It is clear, after considering the data presented in the preceding pages, that no rule-of-thumb method can be devised for determining the weathering qualities of stone in concrete. Physical and chemical tests must be studied in conjunction with the mineral composition, texture and structure of the stone, and can be most intelligently planned after these properties of the stone are appreciated. If any test or small group of tests were to be considered alone, results would be conflicting, as is illustrated by Table 3, which contains appropriate comparative data bearing on the weathering qualities of the stones under consideration.

Color.—Although in some quarries there may be a difference in color between beds of different weathering quality, color is no general indication of quality. In the foregoing table, brownish, light gray and dark gray stone are listed in both the sound and unsound group. The brownish tone merely indicates that a small amount of iron has been oxidized either before or after quarrying. The dark gray or bluish gray color implies the presence of unoxidized organic (carbonaceous) matter, and the light gray to buff colors imply either the original absence of much organic matter or its partial removal and oxidation. None of these changes are significant as regards the weathering quality of a stone.

Fracture.—The fracture of a stone is of some help as an indication of microscopic structure but is useful only in conjunction with other data. The two specimens of sound stone represented in the table and the corresponding beds seen in quarries have smooth conchoidal fractures, but homogeneous masses of dry clay do also. Such a fracture implies a uniform, dense texture and freedom from minute cracks and films or partings of clay minerals. The smoothness of the fracture implies that any clay minerals present are uniformly distributed among the more abundant carbonate grains and are comparatively protected from contact with water. Smooth conchoidal fracture and a very low porosity together form a very favorable impression. The dull, uneven fractures imply that clay films tend to surround the carbonate grains, rendering the stone subject to slow though perhaps inconspicuous crumbling, especially if the porosity of the stone is considerable. The scaly or shaly fracture is a strong indication of clay films along which the stone will split.

Insoluble Content.—The percentage of insoluble material, which comprises all the constituents of the stones except the carbonates of lime, magnesia and iron, consists mainly of finely divided quartz, feldspar, clay (one or more varieties similar to beidellite), organic matter, and negligible quantities of other rock-forming minerals. The total quantity of insoluble material varies through a wide range in both sound and unsound stone, and is of no significance unless the proportions of different minerals in it are known. Clay minerals and perhaps some of the organic matter are the only minerals present that appreciably affect the weathering qualities, and the amount of organic matter in all of the stones under consideration is so small that it is not regarded as a serious factor alone. The most that it can do is to supplement the clay minerals slightly in retaining moisture and decreasing the cohesive strength of the stone.

Water Content a Definite Indicator of Clay Minerals

Water Content.—The amount of clay ma-

TABLE III.—SOME CHEMICAL AND PHYSICAL PROPERTIES OF ARGILLACEOUS LIMESTONES CLASSIFIED BY SODIUM SULPHATE TEST

	Insoluble %	Water % at 100° C.	Specific Gravity true	Specific Gravity apparent	Porosity %	Absorption %	Color	Fracture	Minerals in insoluble part
I.—Unaffected by sodium sulphate:									
Allman Quarry, Penn., "sound" (p. 9-11 of)	27.36	1.30	2.79[1]	2.64	1.9		Brownish gray	Smooth, conchoidal	Quartz and feldspar with clay resembling beidellite evenly distributed.
No. 1 (Table I)	.....	.....	.....	2.68[2]	....	.6[2]	Light gray	.....	.....
No. 5 (Table I)	.....	.....	.....	2.55[2]	....	2.4[2]	Light gray	.....	.....
No. 7 (Table I)	.....	.....	.....	2.65[2]	....	1.3[2]	Light gray	.....	.....
No. 15 (Table I)	.....	.....	.....	2.65[2]	....	.65[2]	Bluish gray	.....	.....
No. 17 (Table I)	.....	.....	.....	2.56[2]	....	2.5[2]	Light gray	.....	.....
Westmoreland County quarry, Penn. No. 1 (A) (Table II and p. 53 and 54)	13.63	.78	2.76[1]	2.75	.14	.11[3]	Blue gray	Smooth, conchoidal	⅔ quartz and feldspars ⅓ clay resembling beidellite evenly distributed.
No. 5 (C) (Table II)	.....	.....	.....	.....	....	.04[3]	Blue gray	.....	.....
No. 6 (D) (Table II)	.....	.....	.....	.....	....	.04[3]	Blue gray	.....	.....
II.—Disintegrated by sodium sulphate:									
Allman Quarry, Penn. "bad" (p. 9)	22.42	1.35	2.83[1]	2.51	4.5	.....	Brownish gray	Uneven, scaly	Quartz and feldspar with clay resembling beidellite concentrated along minute lenses.
No. 3 (Table I)	.....	.....	.....	2.57[2]	....	1.0[2]	.....	.....	.....
No. 9 (Table I)	.....	.....	.....	2.61[2]	....	1.4[2]	.....	.....	.....
No. 11 (Table I)	.....	.....	.....	2.57[2]	....	1.5[2]	.....	.....	.....
No. 13 (Table I)	.....	.....	.....	2.63[2]	....	1.3[2]	.....	.....	.....
Westmoreland County quarry, Penn. No. 4 (B) (Table II)	.....	.....	.....	.....	....	.3[2,4]	Blue gray	.....	.....
No. 7 (E) (Table II and p. 54)	12.27	.50	2.93[1]	2.61	2.5	2.19[3]	Light gray	Uneven with dull luster	Quartz and feldspar with clay resembling beidellite concentrated along minute lenses.
Perry County, Ill. (undeveloped ledge)[5] (p. 54)	41.48	2.50	2.71	2.49	3.3	.....	Blue gray	Rough, uneven with dull luster	Fine silt containing much clay that resembles beidellite.
Iowa (locality not stated)[6]	16.55	.88	2.71	2.58	1.9	.....	Gray	Rough, shaly	Mostly clay resembling beidellite.
Butler County, Kans.[7] (p. 52)									
No. 1	7.23	.70	2.67	2.52	2.2	.....	Buff	Rough, somewhat shaly	60% clay resembling beidellite; 40% fine sand.
No. 4	9.47	.67	2.67	2.30	5.9	.....	Buff	Rough, somewhat shaly	60% clay resembling beidellite; 40% fine sand.
No. 5	19.77	1.73	2.71	2.34	5.8	.....	Blue gray	Rough	60% clay resembling beidellite; 40% fine sand.
No. 6	10.04	.51	2.68	2.21	7.9	.....	Blue gray	Rough	Silty sand with clay resembling beidellite.

Insoluble, water, specific gravities (unless otherwise indicated), and porosity were determined by J. G. Fairchild, U. S. Geological Survey. Microscopic determinations in last column determined by C. S. Ross, U. S. Geological Survey.

[1] High specific gravity due to presence of magnesium and iron carbonates in the form of ferruginous dolomite.

[2] Data supplied by H. S. Mattimore, Department of Highways, Harrisburg, Penn.

[3] Data supplied by P. J. Freeman, Bureau of Tests and Specifications, Allegheny County Department of Public Works, Pittsburgh, Penn.

[4] Failure in sodium sulphate test due to thin layers of shale in otherwise sound rock.

[5] Data supplied by A. E. Stoddard, Assistant Engineer of Materials, State of Illinois Department of Public Works and Buildings, Division of Highways.

[6] Data supplied by R. W. Crum, Engineer of Materials and Tests, Iowa State Highway Commission.

[7] Data supplied by C. H. Scholer, Engineer of Tests, Kansas Highway Commission.

terial present is roughly expressed by the percentage of water in the dried rock powder (column 2 in accompanying Table No. 3), provided the varieties present and their relative proportions have been determined. Beidellite, which is representative of the varieties found in the samples examined, has a theoretical water content of about 20.3% at normal humidity[7]; but the actual water content, according to analyses of beidellite from different localities, varies from 17% to 23%, and that of a single sample varies with temperature and humidity,[8] as does the water content of the closely related clay mineral, montmorillonite. In spite of this variation, however, water is a more definite quantitative indicator of these clay minerals than silica and alumina, as silica is also present in quartz, and silica and alumina both in feldspar and other silicates. If the clay material in all the samples is assumed to contain 20.3% of water, the two sound samples represented in column 2 contain respectively 6.4% and 3.8% of the clay, and the unsound samples contain from 2.5% to 12.3%. These estimates are doubtless low, as beidellite and montmorillonite both lose considerable of their water below 100 deg. C., the temperature to which the samples were heated; furthermore, the indices of refraction of the clay minerals in these samples are comparatively high, and imply that they all contain appreciable amounts of iron, which is accompanied by correspondingly low contents of water. The estimates, however, are sufficient to show that the water content alone, or the percentage of beidellite calculated from it, is not a definite indicator of weathering qualities, as some of the unsound samples contain less than the sound samples; but the presence of 0.5% of water in rocks of this kind is a basis for suspicion, and 1.5% or more should be regarded with grave suspicion.

It is noteworthy that the "sound" and "bad" samples from the Allman quarry contain about equal amounts of water, and that both, according to the preceding statement, should be regarded with suspicion. Examination of the quarry confirms the suspicion, as large fragments of stone identical in appearance with the "sound" sample have been burst by frost action after exposure on the quarry floor, although small fragments have remained intact. This condition illustrates the importance of seasoning, which will be considered in a later paragraph.

Samples A and E from the Westmoreland County quarry both contain too little water to cause much suspicion, and the sound sample, A, contains more than the unsound sample, E. As stated previously, sample E would give a rather favorable impression so far as the absolute content of clay material is concerned. It is the distribution of this clay material and the relatively high absorption of the stone that account for its lack of durability. Here again examination of the quarry was necessary to reach a fair decision.

[7]Ross, C. S., and Shannon, E. V. The chemical composition and optical properties of beidellite: Jour. Was. Acad. of Sciences, Vol. 15, p. 466, 1925.

[8]Ross, C. S., and Shannon, E. V. The minerals of bentonite and related clays, and their physical properties: Jour. Amer. Ceramic Society, Vol. 9, pp. 90-94, 1926.

Specific Gravity and Porosity

Specific Gravity and Porosity.—The apparent specific gravity (column 4, Table 3), which is the determination usually made in physical tests of stone, is of some value as a measure of density, provided the mineral composition of the stone is known. The specific gravity of pure, impervious limestone is 2.71. That of impure, impervious limestone containing considerable quartz, feldspars, and clay minerals whose respective specific gravities are 2.65, 2.57 to 2.70, and 2.47 to 2.63, is correspondingly less. The apparent specific gravities of the Allman and Westmoreland samples would therefore indicate a comparatively high degree of density were it not for their considerable contents of magnesium carbonate and small contents of iron carbonate with respective specific gravities of 3.12 and 3.88.

The true specific gravities of these samples, determined on finely powdered material, is shown in column 3, Table 3; and the porosity, calculated from the difference between true and apparent specific gravities, is shown in column 5 of the same table. Comparison of porosities shows that the unsound samples are decidedly more porous than sound samples from the same quarry. There is, however, no marked break in the range of porosities of sound and unsound stone. It is the size and distribution of the pores and the kinds of minerals surrounding them that are of critical importance. Minute pores, characteristic of these impure limestones, do not give up water so readily as larger pores, and are more likely to be completely filled with water, which cannot help straining the stone when it freezes. If these minute pores allow water to come in contact with those clay minerals that have so remarkable a power of both adsorbing and absorbing water, the danger of freezing is still greater; and if the pores and the clay minerals are concentrated along layers, conditions are most favorable for the splitting or bursting of the stone by frost.

Absorption

Absorption.—Determination of the percentage of absorption (column 6, Table 3), though helpful, is of less value than that of porosity, as thoroughly dry samples must be used and water must penetrate into every pore if the percentage of absorption is to indicate the original capacity of the stone for holding water. There is a possibility, however, that only air-dried samples may be used. These if newly quarried will not be thoroughly dry and the results of the absorption test will therefore be low. It thoroughly dry samples are used it is likely that air will be trapped in some of the pores, and the results of this test also will be low. Stone used in concrete pavements and foundations is likely to be in contact with moisture for long periods and to become more thoroughly soaked than a sample used in a laboratory test. Furthermore, the water reabsorbed by a dried specimen is likely to be less tenaciously held than that originally in it, although this difference should be less marked in argillaceous than in other rocks.

Seasoning

This difference between true porosity and the percentage of absorption directs attention to the practical value of the seasoning of stone before use. It is generally known that stone in the ledge contains considerable water, but the length of time necessary for the evaporation of this water from quarried blocks is too often given scant consideration. In stone below ground water level all openings are filled with water; above ground, water level fissures and other large openings, and to some extent the larger pores, become drained, but continue to serve as water courses from the surface to the ground water level. The smaller pores, however, retain much moisture, and the smallest remain filled. The water thus retained has been in contact with the mineral grains of the rock for such a very long time that it has formed a film of dissolved mineral matter around each grain, and the cohesive strength of the rock is relatively low. It is this condition that accounts for the relative softness of newly quarried rocks, especially sandstones and porous limestones.

After the quarried block has been exposed to wind and sun, this water or "sap" gradually evaporates. The larger pores nearest the surface of the block are readily drained, the minute pores are drained slowly, and finally the dissolved films around the mineral grains become dry and form a cement which holds the grains more firmly together, and gives the dry or seasoned stone greater strength and hardness than the originally moist or "green" stone. The cement material, once it is dry, is not readily dissolved again, and it would require a long time for an immersed, seasoned stone to regain its original softness. Besides this strengthening of the stone, mineral matter deposited by water drawn to the surface tends to seal some of the pores and thus decrease the percentage of absorption.

Induced Bursting Processes

Although the surface of a large block becomes seasoned in a rather short time, the interior is likely to retain considerable moisture and therefore to remain soft, even after an exposure lasting through spring, summer and fall. For this reason large blocks of building stone have been known to burst as the result of freezing, whereas similar blocks worked up into small pieces 2 to 4 in. thick have become well seasoned and remain uninjured. It is also true that in pores close to the surface of a block, where freezing

begins, expansion due to freezing forces some of the water inward. As freezing proceeds inward, a point is reached where all the pores that remain unfrozen are completely filled with water, and the only relief from further freezing is by the cracking or bursting of the stone. In stone of uniform grain and porosity the bursting produces roughly concentric and radial cracks; in stone with shaly layers or obscure bedding planes, along which the water becomes concentrated, cracking follows these directions of weakness. In porous stone with a large proportion of minute or capillary pores, which are completely filled with water even close to the stone's surface, water cannot be driven inward to any appreciable degree and freezing causes crumbling in contrast to less finely porous stone in which the outermost concentric crack may be a few to several inches from the surface.

These conditions also apply to stone for concrete aggregate. If the stone, as is usually the case, is crushed and promptly shipped for use, or perhaps stored for a short time in a bin with no chance to become seasoned, it retains most of its moisture when placed in the concrete. If the concrete is placed in a wall or other structure well above the ground, the aggregate close to its surface will have some opportunity to become seasoned; but in a concrete road or retaining wall where moisture is continually working through the concrete from the soil beneath, there is much less opportunity for seasoning.

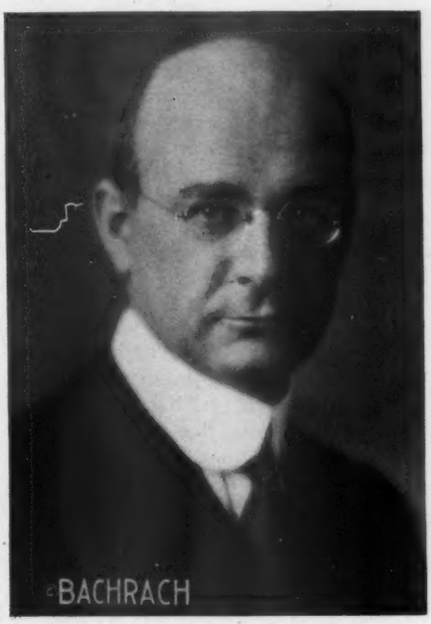
Seasoning Retards but Does Not Prevent Disintegration of Poor Stone

It should be borne in mind that even seasoning will not make a stone highly resistant to weathering if the stone contains clay material like beidellite concentrated along layers, as the clay material after drying will readsorb water in damp surroundings and will still be subject to disintegration by freezing. Disintegration may be retarded but not prevented. This kind of stone should not be used under any circumstances if it is to be subjected to damp and freezing conditions.

It was noted previously that in the Allman quarry the larger blocks, even from the beds whose samples had resisted the action of sodium sulphate, had been burst by frost action, while the small, more readily seasoned fragments and chips from the same beds remained intact. The obvious procedure in handling such stone, if it were practical, would be to crush the stone promptly and to spread the crushed product in thin layers long enough for the entire thickness of the layer to become thoroughly seasoned. Piling the stone out of doors would not do, as seasoning would be effective only to a depth of a few inches.

Long-Time Tests to Prove Quality of Stone Essential

But even though this procedure is impractical in quarrying, it is worthy of consideration in prospecting. If a new ledge is opened and examination of its mineral composition, texture and structure cast suspicion on its durability, it will not be very expensive to quarry a small amount of each bed and to allow some of the quarried blocks to remain exposed through the following winter, while others are promptly crushed, part of the crushed product being spread in thin layers to season and part being used in test pieces of concrete for exposure to weathering. This series of test must last at least a year, and therefore requires patience; but if the quarry is intended to supply stone for several years and requires an outlay of $50.000 to $200,000 or more for crushing plant and other equipment, it is economy to spend one year in proving the quality of the stone. It may be repeated that concrete containing the Allman stone did not disintegrate conspicuously for three years. Even if it is proposed to open a local ledge to supply stone for one big project, the project itself is likely to be several months or a year in getting under way, and during that time the stone could be given a practical weathering test. The sodium sulphate test and artificial freezing test could also be applied, and if stone from a sufficient proportion of the beds resisted them satisfactorily, it would not be necessary to wait for the natural weathering test.



G. F. Loughlin, geologist in charge of stone investigations, U. S. Geological Survey

In regions favored by an abundance of durable stone, any stone viewed with suspicion may be discarded without further ado, but in regions were good stone is scarce or absent, and even stone of fair to doubtful quality is not abundant, the ultimate economy of using local stone by selective quarrying as suggested must be thoroughly considered. An important part of good quarry engineering is the proper use of available material without being too rash or too conservative.

Determination of Iron in Glass Sand

SILICA SAND producers, particularly those supplying sand for glass manufacture, have an especial interest in the recent paper on the methods of determining small amounts of iron in glass sand. This report was presented by G. E. F. Lundell and H. B. Knowles at the recent meeting of the American Ceramic Society and an abstract follows:

The principal requirement of a good glass sand is a minimum iron content and the procedures commonly used for determining this content are the electrometic titration method, the H_2S reduction method, the colorimetric method and also the SO_2 reduction method and the gravimetric.

Of these methods, the colorimetric method normally gives low and the others high results. Correct results can be obtained by proper modifications of the colorimetric method, but at an immoderate expenditure of effort. High results are unavoidable in any modifications of the hydrogen sulphide reduction method and are difficult to avoid in the corresponding sulphur dioxide method. Both the gravimetric (precipitation as sulphide and conversion to oxide) and electrometric methods can give satisfactory results. The former is the most accurate of all the methods but requires numerous precautions and very careful manipulation. The latter is rapid and is entirely satisfactory, provided platinum is excluded and the blank correction is properly determined.

Careful determinations of iron in a sand containing 0.07% Fe_2O_3 by the methods that have been described are subject to errors at least as large as the following:

ERROR LIMITATIONS IN ANALYTIC METHODS

Gravimetric	±0.0005
Electrometric	±0.001
Hydrogen sulphide reduction	+0.006
Sulphur dioxide reduction	+0.003
Colorimetric	—0.004

An agreement to 0.002% of Fe_2O_3 is all that can be expected when a sample of sand containing 0.07% of Fe_2O_3 is analyzed by two analysts using the same method. If the analysts use different methods, their results may differ by as much as 0.01% unless each analyst has corrected his result according to the limitations of the method used—*Journal of the Ceramic Society.*

French Company Formed to Work Asphalt Mine in Syria

A FRENCH company is reported to have been formed at Beirut, Syria, to exploit a mine of asphalt discovered in the Alaouite region. Asphalt is one of the few natural resources of Syria and may become a source of wealth to the country. It is the intention of the government to use it for asphalting all the main roads. Hitherto the product was imported from Europe.

American Concrete Institute Stresses Quality of Cement and Aggregates

Workability as Well as Strength Considered in Connection with Variations in Both Cement and Aggregates

THE yearly meeting of the American Concrete Institute, which closed its sessions March 1, in Philadelphia, was the best attended in the Institute's history. And the program, while it had plenty of interest to the users of cement and aggregates, had rather more than the usual amount of matter interesting to the producers of these materials. The papers went rather deeper into the nature and properties of cement and concrete than they have the past few years. A new purchase specification for aggregates was reported to be ready by Committee E-5, and the same committee and Committee E-3, on research, made excellent reports of work carried on during the year.

Only those sessions which were of interest to the producers of cement and aggregate and the manufacturers of cement products are reported here.

Workability

Workability, the most important factor of concrete after strength, and sometimes, as P. H. Bates (U. S. Bureau of Standards) pointed out, of even more importance than a specific strength, had a whole session to itself, in which were considered all the factors affecting workability.

The first paper on the subject was by ***George A. Smith*** and ***George Conahay,*** who hold the Celite Co. fellowship at the Bureau of Standards. It was read by Mr. Conahay, and it gave the authors' work in designing a machine to test workability. Various methods were tried, such as drawing a ball through a mass of concrete and deforming a mass in a flexible cylinder, but the final machine was a modification of the penetration apparatus used by Pearson and Hitchcock of the Bureau in their work on the effect of admixtures. (A. S. T. M. Report for 1923, vol. XXIII, part II, p. 276, and A. C. I. Report for 1924.) But Smith and Conahay found the original form to be too insensitive, and they changed it by using three rods to penetrate the concrete instead of one, and adding an automatic tripping apparatus which struck the rods with blows of constant strength. This gave them a rather exact measure of the force in inch-pounds required to force the rods into the concrete.

In this way the workability of mixtures having the same flow or slump (approximately) was measured and wide differences were found. This fact seemed to puzzle many of the members, as was shown in the discussion that followed. The slump test has apparently been taken as a measure of workability, whereas, as the paper, and previous papers referred to, showed it is possible to have two concretes with the same slump and approximately the same water ratio, one of which will be much more workable than the other. This is because workability depends on other factors than the water ratio, factors which reduce the internal friction, or substances that act as lubricants. As the paper which followed showed, the character of the cement used may be a most important factor of this kind.

"Lubrication" Admixtures

The authors reported that they had checked the work of Pearson and Hitchcock referred to above and found that 3 lb. of Celite, 6 lb. of hydrated lime and 25 added pounds of cement to the sack were nearly of equal value in giving "lubrication" and hence greater workability to the concrete. These reduced the work of penetration from 400 inch-pounds for the plain concrete to 223 for the Celite, 186 for the kaolin and 223 for the hydrated lime admixture. The added 25 lb. of cement reduced it to 236 inch-pounds. The results are close to those obtained by Pearson and Hitchcock, but the machine showed itself to be more sensitive when tested with smaller amounts of admixtures.

The discussion which followed was long and interesting, although much of it only served to bring out the confusion in the minds of some members between slump, or consistency, and workability. But aside from this, J. C. Pearson, who did part of the previous work referred to, said that he was not convinced that the machine, while it was better than the original machine, was wholly satisfactory. He thought that some way should be devised to actually measure the rate of shear of wet concrete and suggested a cylinder with paddles. Prof. Talbot said he had tried an ice cream freezer and several other forms of cylinders with paddles, but without satisfactory results. The force required to move the apparatus at all was so much greater than the difference in shear of two mixtures that the difference was hard to read.

Plasticity of Different Brands of Cement

P. H. Bates, of the U. S. Bureau of Standards, said that in ordinary concrete the cement itself is the only substance affecting workability. The coarse aggregate is not workable and adding sand does not make it so. Even adding water does not produce workability in the strict meaning of the word. Leaving admixtures out of consideration, cement is the only substance that furnishes "lubrication," and just as lubricants differ among themselves, so cements differ in lubricating power. "Just as we have stopped talking about all men being created free and equal, because we know they are not, we have stopped talking about all portland cements being the same, and now we are talking about the differences among them," was the way he put it.

Mr. Bates first tested 12 different samples of cement by making them into a paste with 25% of water which he placed in an extrusion apparatus. This measures the force required to push the paste upwardly through an orifice. With 25% of water some of the pastes were very wet and some were so dry they could not be made to extrude. Examples that did extrude showed differences like a 3-in. extrusion under 350 lb. pressure and a 1½-in. extrusion under 500 lb. pressure in the same time. Mixed with 30% water some of the cements were too wet to be tested in this apparatus.

Test of Cement Pastes

The ball plasticimeter, an old device much used in the testing of clays, was used on pastes containing 36% of water and results which approximated those of the first test were obtained. The final tests were made on pastes with 42% water in a modified form of the capillary plasticimeter. This is a simple device, an inverted bottle with a capillary tube passing through the stopper. A tube rising from the base of the bottle is calibrated and this is filled with kerosene, so that as the cement runs out through the capillary tube the volume issuing may be read on the kerosene tube. This test showed wide variations like the preceding tests.

The greatest plasticity was shown by one of the new cements which is finely ground, of which Mr. Bates said it was hardly fair to include in the tests. But the differences in the other samples were very marked. The paper was illustrated by lantern slides of graphs in which the differences were plotted.

These tests were originally devised to test cement for masons' work, "fatness" being an important property of cement for this

particular use. But they served to show that there are important differences in cements which affect workability, or plasticity, or however we may choose to term the particular characteristic tested.

Aggregates as a Factor of Workability

A. T. Goldbeck, director of the bureau of engineering, National Crushed Stone Association, read a paper showing the effects of the grading and the character of aggregates on workability. His talk began by discussing the need of workability under different conditions. The degree of workability required he found dependent on:

(a) The mode of transportation (as in a truck or by flowing in a chute).

(b) The character of the structure (highway slab, heavy mass concrete, or thin walls with much reinforcing).

(c) Relation to other factors such as the economy of the mix.

Discussing the last, he said that added workability, while otherwise desirable, might sometimes cost too much. A member discussing this later said that he sometimes found the cheapest way to secure workability was to use more labor in placing.

The characteristics of aggregate affecting workability Mr. Goldbeck found to be:

1. Shape of particles.
2. Smoothness of surface characteristics of the particles.
3. Mechanical grading of the particles from the coarsest to the finest.

Concerning the first of these he said that angular fragments, like those of crushed stone or slag, made a harsher working concrete than the pebbles of gravel. This was due not only to the interlocking effect of rough fragments but to the greater space in voids to be filled. Of course this applies to proportions of equal volumes, as mixes of 1:2:4 ratio and the like. But he also showed that by increasing the proportion of sand with angular coarse aggregates, mixtures which would work as easily as those with rounded fragments could be made without the use of additional cement. Examples from tests by the Bureau of Public Roads and others were given to illustrate this principle. In some cases an even higher modulus of rupture was obtained by using more sand (with angular fragments) and the same amount of cement.

Discussing grading, he quoted Fuller and Thompson's work which showed the "straight line grading to be the best for the coarse aggregate, while the sand grading should plot on the curve of an ellipse. But, he said, these early results had to be reconsidered in the light of modern research, which he developed at some length. He laid down these rules: (1) The stiffer the mix the finer should be the aggregate for equal workability. (2) The higher the strength the coarser may be the aggregate having a given maximum size. This is undoubtedly because of the use of more cement containing fine particles which lubricate the mass. (3 It is possible to obtain a sufficient degree of workability, irrespective of the maximum size and irrespective of the aggregate characteristics, by changing the concrete proportions.

Effect of Voids

Discussing the fineness modulus of aggregates, he showed that mixed aggregates with about the same fineness moduli might differ greatly in workability because of the difference in voids. Examples from the Kansas state laboratory were a mixed aggregate with a fineness modulus of 5.93 and 48% voids and one with a fineness modulus of 5.76 and 42% voids. The first batch had 6% more voids to fill, which would make the mortar less effective. It needed more fine particles, and their addition, of course, would reduce the fineness modulus a little, to secure equal workability.

In conclusion he stated that a "straight line" grading from the maximum size to one-tenth the maximum size provided a well graded coarse aggregate (stone) from the standpoint of workability. The difficulty of preventing segregation was recognized. The grading of given maximum sizes should be such that the limits of fineness moduli given in the well-known tables derived from the work of the Structural Materials Research Laboratory are not exceeded.

The grading of the fine aggregate, Mr. Goldbeck said, should be as coarse as possible, for economy, but should not result in a fineness modulus in excess of that stated in the tables previously referred to for a mortar having the same proportions as the particular concrete in which the sand is to be used.

Other Factors of Workability

Factors affecting workability, such as the amount of water used, the time of mixing, control by prehydrating cement, and the like, were taken up in papers and discussions, but they will be omitted here as not of direct interest to cement and aggregate producers. In speaking of the effect of water, E. L. Bertin of the White Construction Co., Inc., New York, discussed the investigations of Tokujiro Yoshida and concluded from them that variations in workability which may be obtained by adding water, except for rich mixes, were limited.

Volume Change and Cracking

One session was largely given up to discussing the causes of volume change and the cracking and crazing of concrete, and the first paper was presented by ***Prof. Alfred H. White, Vilhelm A. Aagaard*** and ***Axel O. L. Christensen,*** all of the University of Michigan, joint authors. The formal paper had been preprinted and Mr. White chose to give an informal talk on volume change and cracking rather than to read it.

He began with a non-technical but precise description of how portland cement sets and hardens. Clinker, he said, looks like particles of granite under the microscope, that is, it is a collection of crystallized minerals. Water acts only on the surfaces of these minerals, and if the pieces of clinker are large it takes a long time for the water to get to the center. After the reaction was started the only thing that can stop it is the lack of more cement or more water, an important thing to remember in considering volume change. An appreciable part of the ground clinker (cement) is never reacted upon by water. He showed a lantern slide of a thin section of cement mortar to illustrate this and pointed out the pieces of unaltered clinker. But these, he said, would hydrate if a crack developed by which water could reach them, sometimes a cause of volume change.

When cement and water are mixed together the finest powder of the cement reacts with the water in a few minutes. Particles coarser than 200-mesh react very slowly and play only a small part in determining the final strength.

Setting of Cements

The aluminates act more rapidly than the silicates in the beginning. Under the microscope, he said, one might see needle-like crystals shooting out, and the interlocking of these crystals is supposed to be the cause of the initial set. A little later a white, cloudy substance forms and obscures everything so that what goes on thereafter cannot be seen. But it is known that there are two kinds of reaction, one of which forms crystals, the other colloidal substances, and colloids have the property of taking up water and swelling. It is in this way that the colloids fill the voids between the crystals. At times there is an actual conflict between the colloidal and crystalline reactions, and this conflict probably explains such retrogressions in the strength of concrete, as take place at the end of three months, noted by many observers. After passing such a climax a greater proportion of colloids is formed and the strength of the cement increases.

But colloids, he said, not only swell when wet; they shrink when they dry out, and this is the cause of surface cracking, or hair cracking. Many of these cracks may be microscopic, but they must exist where the surface of the concrete is dry and the interior wet, because the "skin" of the concrete contracts. It cannot stretch to cover the mass of greater area below. As this shrinkage and cracking are due to the drying out of the colloids of the cement, one should expect to find the effect greater in rich mixes than in lean mixes, and that is precisely what we do find.

Aggregates Give Stability to Concrete

This shows that aggregates have a more important part to play than merely filling space. They give stability to concrete by reducing the amount of shrinkage, just as

they do in wall plasters made of other cementitious materials. And there is an advantage in using lean mixes wherever they can be used, since they shrink less on drying. The early life of concrete is its critical stage, as the effects of wetting and drying are more marked.

Some very interesting slides were shown with this paper. One set was of graphs illustrating the growths of bars of neat cement. They had been under observation a long time and had never stopped growing, although the rate of growth had varied. Another slide showed a thin bar that had been kept at the same temperature all its life but had been badly cracked by repeated wetting and drying out. Mixtures with plenty of aggregate tended to decrease rather than increase, to shrink rather than expand, and a bar made of a rich mix on one side and a lean mix on the other showed a reversal of stress.

The conclusion which at least one listener drew from Prof. White's remarks was that the value of impermeability in structural concrete cannot be overestimated. There is no way of preventing concrete surfaces from wetting and drying, but if the effect is confined to a mere surface film no harm is done. And this conclusion was also drawn from the papers which followed.

A Study of Crazing

P. H. Bates followed Prof. White and gave an informal talk on crazing or hair-cracking. He said that the experiments carried on at the Bureau of Standards were made with cement that was obtained as clinker and ground in the laboratory. It was used when rather new, which increased the tendency to crack. Two other brands of cement were tried in a limited number of experiments, and one of these was a very plastic cement.

An electric fan was turned on the specimens as soon as they were made, but this did not cause cracking. He said, however, that this might have been because the cement used was plastic enough to hold all the water. The specimens which showed a little laitance showed hair cracks, but these cracks were only in a thin film on the surface and they afterwards disappeared. This kind of crazing might even be of benefit, as in the case of stuccos and interior finishes, by giving a fresh, clean surface. There was no indication whatever of later disintegration from the formation of these hair cracks.

Considering the effect in stucco, the purpose for which the tests reported on were originally made, Mr. Bates said that cracking would be caused if the surface was troweled without packing the stucco and working it into the mass. He instanced some stucco repairs to the brown-stone fronts of old New York houses which showed this plainly. The cavities left by spalling of the stone had been filled with stucco which the mason smoothed over lightly, and these patches all cracked badly for lack of working. He quoted John J. Early as an authority on plastering, who said that the character of the work had the greatest influence on lime and gypsum plasters as well as those made from cement. The energy put upon stuccos and plasters Mr. Bates thought to be a measure of the freedom from cracking.

Crazing Does Not Cause Disintegration

Dr. W. K. Hatt, of Purdue University, read a written discussion of Prof. White's paper, by ***R. E. Mills,*** and added some remarks on results from his own tests of volume changes. Neither he nor Mr. Mills had found that rapid drying out of the specimens with a fan, even when hot air was used, caused more crazing. The strongest bars were those dried out in this way. He wanted to distinguish between *cracks,* water marks and surface crazing, and he thought that the distinction ought to be kept in mind by writers on concrete.

His own work confirmed the results found by Prof. White, that neat cement bars continued to increase in length and concrete bars tended to decrease in length.

He had found many crazes on the surfaces of test pieces, but none of them went down into the concrete, and none of them had anything to do with the failure of the concrete when the bars were broken. He did not think that the surface cracking described by Prof. White ever deteriorated well-made structural concrete, and he had had some concrete under his observation for a very long time, as much as 35 years in the case of one sidewalk.

Cracking Ascribed to Surface Tension

Dr. Maxmillian Toch, of Toch Bros., gave a new angle to the discussion of cracking and crazing by saying that in the work conducted in his own laboratory during the past year he had satisfied himself that surface cracking was a surface tension phenomenon. He explained that surface tension was the force that causes the molecules of water to draw together, as seen in a rain drop on a window pane, something that showed itself only where the water was in contact with the air. Surface tension of water may be destroyed by various agents such as benzine and alcohol. It is a very real force and plays a part in many industrial processes.

He believed that hair cracking was due to the effect of the water to "pull itself together," as it does on a rain drop on a window. For this reason the rapid drying out of the *surface* of concrete might prevent cracking to some extent, as Mr. Bates and Dr. Hart had noted that it did. Sidewalks, he said, did not hair crack because the surface water evaporated quickly. This also stopped the formation of lime in the setting of the cement.

Experiments which tended to confirm his theory were made using 6½, 7½ and 9 gal. of water per bag of cement. The wetter the mix, the greater the tendency for cracks to form, he found—another good argument for using a low water-cement ratio. An example of cracking from too much water might be found on one floor of the Army and Navy building in Washington. This, he said, had been laid of very wet concrete and it was badly "alligatored."

Volume Change Due to Differences in Aggregates

Cloyd C. Chapman, consulting engineer, New York, said that all the previous speakers had omitted to mention one important cause of volume change which is different in the aggregates used. The time was so short that he could not go into the matter in detail but he referred his hearers to papers given at previous meetings of the institute covering this point. In one extreme case he had found six times as much volume change with one kind of aggregate as with another kind, the same quantity of cement being used in both cases.

Reports of Committees—Research

The report of Committee E-3, on research, of which ***H. F. Gonnerman,*** Portland Cement Association, is chairman, is a compilation of the testing and research on cement and aggregates going on in the United States. There is a great deal of it at the present time and the report contains 32 pages of fine print so that only the high spots can be touched in this abstract. A part of the report is a bibliography of foreign and American publications, both books and magazine articles, which have appeared during the year. Many of these are original with Rock Products and many others have been abstracted or translated in full for publication in Rock Products.

In researches on cement the best known are those Dr. Bogue is conducting for the Portland Cement Association at the Bureau of Standards. But others which are very practical are in a series being carried out by the Lehigh Portland Cement Co. They include work outlined by the Institute last year, but it has been carried farther than was suggested. The Lehigh company is carrying out a lot of work on volume changes with different cements in relation to free lime content, strength, behavior under accelerated curing and the like, a long time investigation. Another series by this company is on clinker ground with three kinds of gypsum, one normal, one with anyhydrite and one a by-product gypsum from the phosphate industry. It has also in hand a study of extending standard methods of mechanical analysis so that they may be applied to the determination of the fineness cement and other fine powders.

The Portland Cement Association is conducting a series on the equilibrium of hardened cement pastes, which will show the tenacity with which the water is held by the cement under different conditions that concrete has to meet. The Michigan and Pennsylvania state highway departments are

studying the effect of the quality of different makes of cements on the resulting concrete. Lumnite cement is being studied intensively by Washington University (St. Louis) and some important conclusions have already been arrived at.

Research in Aggregates

What is possibly the most important research work going on in studying aggregates is being carried out by the University of Maine. This is an investigation into the effect of the mineralogical and chemical composition of various Maine sands. It has already been shown and reported that an increase of granitic material (the portion of sand which is either quartz, feldspar or mica) results in the lowering of the mortar strength (Proceedings, National Academy of Science, Vol. 13, p. 351). A second report (Proceedings, National Academy of Science, Vol. 13, p. 263) gives the results found in testing for the effect of the iron content of sand on the strength of mortar. The greater the iron content the higher the average tensile strength was found to be. We may have to revise our definitions of aggregates as "inert" substances when this and other work of the kind is farther along.

Many state highway departments are studying local aggregates and the concrete made from them. The Minnesota department finds that the physical characteristics of aggregates do have some effect on the strength of concrete, especially in transverse tests. Sandstone, for example, is much weaker in cross bending than its compressive strength would indicate. It is also testing to establish limits for abrasion tests on the smaller sizes of gravel and on crushed gravel, and to establish more reliable tests for the quality of concrete sand.

The Kentucky highway department has found it possible to make a concrete that has already lasted six months, of a local shale, which failed when exposed to weather for 30 days. It has also worked out a mix of one-third stone screenings to two-thirds sand which increased the mortar strength ratio from 0.5 to 1.1, and made satisfactory concrete in a properly designed mix.

The Portland Cement Association has undertaken an investigation to clear up some of the uncertainties regarding the effect of various properties of the aggregate on the properties of the concrete. Studies will be made on the relationship of shape, size, gradation, surface peculiarities and other properties of the aggregate to workability and strength. The association is also carrying on a study of the methods of determining moisture in sand.

A general study of the effect of various admixtures, including "calotom," calcium chloride and hydrated lime are being made by the Minnesota highway department. The University of Missouri is studying the effect of hydrated lime, "Celite" and "diatome," another diatomaceous earth, are being studied in the University of California and "atomite" a diatomaceous earth mixed and then ground, in Oregon, is being studied by the University of Oregon. Many other tests interesting to the producers of cement and aggregate are reported, but rather less directly than those listed above.

Aggregates Committee's Report

Committee E-5, Aggregates, of which ***R. W. Crum,*** now of the National Research Council, is chairman, presented its report through its secretary, ***F. H. Jackson,*** of the Bureau of Public Roads. The committee has prepared a new purchase specification for fine and coarse aggregates, but it was not ready in time to be preprinted and hence it was not formally presented to the institute at this meeting. It will be printed and sent out for discussion shortly.

The printed report is largely a record of the recommended studies of gravel carried out by the sub-committee on gravel, Stanton Walker, chairman. It discusses the abrasion test for gravel and proposes a modification of the usual test which is has submitted to committees of the American Society of Testing Materials and the American Association of State Highway Officials. The method is the joint work of A. S. Rea, F. H. Jackson, Wallace F. Purington, A. T. Goldbeck and Stanton Walker, and it consists, briefly, in screening the gravel into sizes and combining the sizes into specified gradings before testing in the usual manner with the Deval machine.

The men who made up the aggregate committee of the institute are, many of them, members of the committees of other specification making bodies, and it seems to them desirable that purchase specifications and methods of testing aggregates should be uniform for all of them.

Report of Building Design Committee

A report that may eventually affect the production of cement and aggregate very markedly was presented by Committee E-1, on reinforced building design and specifications of which ***F. R. McMillan*** of the Portland Cement Association is chairman.

This report has resulted from a joint study of a proposed building code by the committee and a committee from the Concrete Reinforcing Steel Institute, and it has been about ten months in preparation. It contains 42 pages and covers all the details of concrete construction together with a much needed list of definitions. It is said that if the recommended code be adopted by cities the cost of concrete construction will be reduced; it is estimated that the reduction will be 8% for Chicago.

The committee on concrete roads and pavements, S-6, presented a very brief report suggesting a change in the wording of the clause relating to joint fillers.

Educational Papers

Papers of an educational nature were presented at several sessions, these being largely addressed to architects to show them the possibilities of concrete construction. One of the best was by ***W. E. Hart,*** of the Portland Cement Association, describing some of the newer structures that have been erected in Pacific Coast towns, all the way from Seattle to San Diego. The illustrations were magnificent examples of the possibilities of concrete in the better class of construction, including office buildings, apartment houses and hotels. One method of construction which seemed to be new to many of the members, as well as to some of the architects, was that of casting the ornaments of the building (very elaborate ornamentation in some cases) in place. This was done by putting plaster of paris molds in place on the forms so that they would be filled as the remainder of the form was filled. The plaster molds are left in place for a month or so and then carefully broken away, allowing undercut designs to be used without danger of breakage.

At the annual banquet the Wason medal of the institute was presented to ***Arthur R. Lord*** for the most meritorious paper of the 1927 convention, "Notes on Concrete—Wacker Drive, Chicago." The Turner medal "for notable achievement in the concrete industry" was presented to ***Dr. Arthur N. Talbot.***

Concrete Products Sessions

The importance that is given to the concrete products by the American Concrete Institute was shown by the fact that two of the seven sessions of the meeting were given to them, and that several papers and discussions in other sessions had to do with products.

Roofing Tile

Concrete roofing tile problems were discussed by ***Leslie H. Allen,*** president of the Hawthorne Roofing Tile Co., New York City. His paper spoke of both mechanical and chemical difficulties that had been overcome, the chemical difficulties coming from the use of color. Certain colors were found impossible in tile making. Speaking of the painting of tile, he said that trouble had come from the oil coming out and oxidizing, making black spots and this was prevented by using a solution of tallow. In conclusion Mr. Allen said he thought that roofing tile would become the most used form of concrete roofing, it had so many advantages such as its fire-resisting qualities and the ease with which it could be placed.

Dr. Maxmillian Toch in discussing the paper said that Mr. Allen was right in condemning the use of lamp black which contained oil, condensed with it in the process of manufacture. But carbon black, made from natural gas he said is free from oil and can be safely used and ferrous oxide makes a good safe black as well.

Efflorescence on tiles he thought was due to the gypsum in the cement going into solution and then crystallizing on the surface. The bad effects of zinc and lead chromates as concrete colors he thought

should be emphasized more than the paper had emphasized them.

Viewpoint of the Architect

The viewpoint of the architect and engineer on concrete products was discussed by ***George J. Eyrick, Jr.,*** of a well-known firm of architects in Detroit. The paper was friendly to concrete products, but he pointed out that the makers of them had much to do before they could overcome the prejudice against them that existed in some places. An architect might see so many bad examples of concrete trimstone in some cities that he would be afraid to take a chance with it. The old rock face blocks had prejudiced many architects against all kinds of concrete masonry units, and he had found some architects that were surprised to learn that any other kind were made.

There should be co-operation between architects and products manufacturers with national specifications for both block and trimstone. And the manufacturer should see that the architect gets what he wants. If he needs a limestone effect it is the business of the products man to know how to give it to him.

He advised the products men, however, to forget imitation altogether, and to sell their products as made of a new material. This is the age of synthesis, and concrete is nothing more or less than synthetic stone. In making it we can secure beautiful effects impossible to secure with natural stone. A wall of concrete blocks with the aggregate exposed he thought was a very handsome wall.

One difficulty found with concrete masonry units for high buildings and partitions had been their weight but this is being overcome by the use of light weight aggregates, which reduce the weights of foundations and steel. Another, he said, came from the cost of good concrete trimstone in certain localities, and he gave an instance where a good natural limestone trim could be had for 58c. per cubic foot less than concrete, which saved several thousand dollars on the cost. And a third difficulty came from the fact that manufacturers were not always careful enough about the handling of their products and this resulted in chipped and cracked pieces that made an unsightly wall.

In concluding he said that more study should be put on concrete masonry units not to make them stronger but to make the weight and the surface texture more satisfactory than it is as a general rule.

Need Specifications for Concrete Stone

The need of national specifications for concrete stone, trimstone and the like, was the subject of a paper by ***C. Von de Bogart*** of the Economy Concrete Co., New Haven, Conn. He said there was a need of a national organization of concrete stone (cast stone) manufacturers, as theirs was distinctly a group problem, in spite of local conditions. All concrete is subject to weathering, volume change and similar effects wherever it is used, and specifications could be drawn to cover general conditions.

Such a specification is needed if the products manufacturer is to go to the architect and the owner of the building convincingly.

M. A. Arnold, Arnold Stone, Brick and Tile Co., Jacksonville, Fla., in speaking of the need of a national certification plan said that the previous speakers had made the same arguments for national specifications that he had in mind. But he wanted first of all to have some settled use of terms in the industry. At present there was a long list of words used to describe the product as cast stone, concrete stone, composition stone, synthetic stone and so on. His own firm used "cast stone" on its letter heads in its literature but they would be glad to change to the use of "concrete stone" if everyone else would use the term. Personally he preferred cast stone as the use of concrete stone might cause confusion between trimstone and concrete masonry units.

There were certain classifications that could be made, two of them being dry tamped stone and wet cast stone. Other classifications he suggested were based on absorption and surface treatment. One classification would include all cast stone with unfinished surfaces; another stone with special colors and textures, a third that with special compressive strength requirements and a fourth that with definite absorption requirements. An added clause would specify that all exposed surfaces in either class might or might not be cut or otherwise finished.

Mr. Arnold made the very practical suggestion that a committee of the institute take up the study of a national cast stone specification and the meeting voted that the board of direction should select such a committee.

This paper caused a lively discussion which was opened by a letter from ***F. M. Emerson,*** of the Emerson Concrete Stone Co., Boston, Mass. Mr. Emerson thought that there was no need for either an organization or national specifications, as all their purposes might be served if the manufacturer would deposit a sample of his work with the architect along with a guarantee that all the trimstone submitted should be equal to the sample. This would be better than groping about trying to express the quality of the product in writing. The method of selling and pointing need not be specified, and there is no more need of specifying how the concrete was to be made than there was for the architect to specify how the steel that went into the building should be made, in his opinion. Few of the hearers seemed to agree with the views expressed in this letter.

Much of what followed was a discussion for a good name for the product. One member said he found "architectural stone" a good name, and another liked the name "cement stone," which he gave his product. One member said that "synthetic stone" was a good descriptive name, but another rose promptly to declare that "synthetic" was a disreputable word just now. For a reason not explained everyone laughed at this.

Summing up the discussion, Chairman E. D. Boyer said he would admit that, not because of any fault of the product, much had to be done to place the relations of architects and trimstone manufacturers on a satisfactory basis.

Better Stucco

Better stucco was the subject of a talk by ***William S. Steele,*** president of the Mohawk Stucco Co., Brooklyn, N. Y. He said that portland cement stucco might be in danger from the apparent ease with which it could be made and he spoke of what had happened in the magnesite stucco industry when it was turned out by a number of manufacturers, some of whom did not know how to make a good product.

The fundamental principles of making portland cement stucco are always the same but local conditions have to be taken into account. Lime, for example, should not be used where there is much contact with sea air. Various kinds of fillers cause cracking and these should be known and avoided. The necessity of securing plasticity he thought an important point. As to colors he believed it was better to standardize on a few colors, but these should be reliable.

He thought what the industry needed was the unselfish co-operation of all portland cement stucco manufacturers to insure that nothing but a satisfactory product went to the public.

In the discussion following this paper a member pointed out the need for more information on cement plasters and mortars as distinct from mass concrete. A wide variation had been found in the products on the market, some of them containing as much as 50% lime. The grading of the aggregates and the proportion in the stucco varied, and after examining the aggregates it was easy to see that much lime had been added to secure plasticity. He thought the A. C. I. specifications should be changed, as stucco made with mixes which did not conform to them tested three times the strength of stuccos made to conform with them.

How a State Law Helped Concrete Units

The paper delivered by ***D. R. ("Spec") Collins,*** of the A. W. Friske Co., of Alois, Wis., "How a State Law Helped Concrete Units," was substantially the same as his paper delivered at the meeting of the Wisconsin Concrete Products Association in February, and reported in the February 18 issue of Rock Products on page 105.

The paper by ***L. E. Grube,*** Sheboygan, Wis., president of the Wisconsin association, on "Curing Concrete Products After the Steam Cure" was also the same as was

delivered at the Wisconsin convention and was reviewed in Rock Products for February 18, on page 106.

Light Weight Aggregates

A. W. Scheer, president of the Best Block Co., Milwaukee, gave his experience with making haydite block. Haydite he said was shale burned in such a way that it would "puff" and increase in volume as the water was driven off, making a light weight material. His supply came from Danville, Ill. It was received in cars which were dumped to a track hopper and sent up an 18 deg. belt to the bins. Below the bins a 40 cu. ft. car runs on rails to take the haydite to the mixer.

A 42 cu. ft. mixer is used and 3½ bags of cement and 35 gallons of water go into each batch, the water being added in two lots. Mixing time is 9 minutes. The mix is not too plastic, much of the water being absorbed by the aggregate, and this is good for the final curing.

Increasing the tamps increases the strength of the block but also increases the weight. Air curing is now employed but it is proposed to give 48 hr. steam curing. The blocks are stored 30 days before being shipped. The blocks (8 x 8 x 16 in.) he said, weigh 25 lb. and meet all the Wisconsin tests for strength and absorption, and they test satisfactorily for fire resistance in the Underwriters laboratory. They are a good sound insulator.

A member asked what the price was as compared with gravel block. Mr. Scheer said he did not know the price of gravel block but another member said he was buying gravel block at 15c. and 16c. and haydite at 18c.

Notes on Freezing Block

Perhaps as interesting a part of the meeting as any was the discussion of freezing and thawing blocks that was not scheduled on the program. ***C. A. Wiepking,*** testing engineer of the Department of Public Works, Wisconsin, gave the results of a study of 100 alternate freezings and thawings on gravel blocks sent to the state laboratory. The strength of the blocks increased (from 1043 lb. to 1120 lb. average) and the damage done by freezing was negligible.

E. Christensen, who is with the company controlling the Straub cinder block patents, gave his experience in freezing and thawing cinder block. He found that these too increased in strength and he ascribed this to the curing that went on in the thawing water. As much as 16.5% increase in strength had been noted. Rich mixes went to pieces the first freezing.

Mr. Christensen explained the "wetness factor," a term that had been brought out by a Swedish investigator. This is the ratio between the water taken up by the block in absorption and the water which might be held in its pores. With the right "wetness factor" there would be space for the absorbed water to expand on freezing and this should be more than 10%, which is about what water expands in freezing. He thought the proper wetness factor should not be greater than 85%. Neither absorption nor porosity can be considered by itself, the two must be taken together.

One member asked how to determine porosity. Mr. Christensen said the proper method was to determine the volume of a specimen and then to grind it down to 200 mesh and find the true specific gravity of the powder. From this the absorption and the volume the porosity could be easily calculated.

Report of Products Committee

Committee P-1, on standard concrete building units, of which ***C. L. Bourne*** is chairman, brought in its report. Mr. Bourne asked to have the report accepted except for the specifications for brick and sewer manhole blocks. The brick specification was not the same as the A. S. T. M. specification and it was suggested that committees from both societies get together and agree on a specification. The manhole block specification should be continued tentative to allow the wood "sewer" to be placed in the title. Manhole blocks are used for other purposes than building sewers, and for these purposes the characteristics needed for building sewer manholes are not necessary.

Tests of Large Concrete Cylinders

DURING the month of December the bureau tested a large group of concrete cylinders. The cylinders were made during the construction of the Santeetlah dam of the Tallassee Power Co., shipped protected by moist cinders and burlap, by flat car to the bureau and tested at the age of approximately three months. They were all in the proportion of height equal to twice the diameter, and had been accurately made to dimension. There were eight sizes of specimens, 2, 3, 6, 8, 12, 18, 24 and 36 in. in diameter. The largest cylinders weighed approximately 6300 lb., and were considerably larger than any heretofore tested.

The ends of the 2- and 3-in. cylinders were ground to a plane surface before testing. The 6-, 8- and 12-in. cylinders were capped with plaster of paris previous to being placed in the testing machine. The larger cylinders were capped in the testing machine. All aggregate was obtained from crushing the natural rock. The larger pieces of the aggregate were bounded in general by two flat surfaces indicative of the lamellar nature of the rock. The pieces were not thin, the proportion of length to thickness being in the nature of one to six. The maximum size of the aggregate varied, running to a maximum of 10-in. material in some of the larger cylinders. The fine aggregate was obtained from the same rock, practically all passing the ⅜-in. sieve and having an approximate fineness modulus of 3.5.

Examination of the aggregate showed two types, one a laminated and fibrous rock, evidently a schist, containing biotite, muscovite, pyrite, a little quartz and one unidentified mineral, possibly pyrophyllite, the other a gneiss composed of biotite, muscovite, quartz, plagioclase, feldspar and one or two unidentified minerals present in small amounts.

One group of cylinders, including specimens of every size, was made in the proportion of 1 part cement to 2.7 parts of aggregate, all aggregate having been smaller than the ⅜-in. sieve. In this group the 36-in. cylinders developed an average compressive strength of 2550, the 12-, 18- and 24-in. specimens approximately 3000, the 6- and 8-in. specimens 4100 and the 2- and 3-in. specimens approximately 5100 lb./in.^{2}

In the other groups of cylinders the 36-in. cylinders contained aggregate of maximum size varying from 2½- to 10-in., proportions being approximately 1:3:3, 1:3:4 and 1:3:4.6. Before filling the 8-in. molds all aggregate above 2½-in. was removed from the concrete, for the 6-in. molds all above 1½-in. and for the 2- and 3-in. molds all above ⅜-in. The strength of the 36-in. diameter cylinders varied from 1500 to 3100 lb./in.^{2}, compared with the minimum and maximum average strengths of 2260 and 4400 for the 8-in. and 3130 and 4700 for the 6-in. cylinders. There was a general tendency for the smaller specimens to give higher strengths.

Stress-strain readings were taken on the 18- and 36-in. diameter cylinders, readings being taken without stopping the application of load. The readings were continued until maximum load was reached. The ultimate strains varied from 0.0015 to 0.0032 in. per in., and the initial modulus of elasticity varied from 2200 to 3,600,000 lb./in.^{2}. In all cases the average modulus for the 36-in. cylinders was higher than for the 18-in. cylinders.—*Technical News Bulletin.*

Bulletin on the Geology of Vinton County, Ohio

A BULLETIN on the "Geology of Vinton County" has recently been issued by the Geological Survey of the State of Ohio, under the direction of J. A. Bownacher, state geologist. Wiber Stout is the author of the work. The book is illustrated with both photographs and maps, and contains about 400 pages bound in a good quality board binding. Rock products men will find the portions concerning the sandstone and limestone formations of the Pottsville, Allegheny and Conemaugh formations particularly well worth going over. Each township is taken separately in each division of the bulletin so that it is easy to make a survey of any particular location without the necessity of going over the whole contents of the chapter. The subject matter is covered thoroughly and concisely, making the bulletin an excellent reference book for those interested in the rock formation in southern Ohio and particularly in Vinton county.

The Sand and Gravel Resources of the Trinity River District, Texas

A Good Example of Adapting Operations to Meet Specific Local Conditions—Also Emphasizing the Limited Resources

By Edmund Shaw
Editor, Rock Products

FEW SAND AND GRAVEL DEPOSITS anywhere in the world have been of such commercial importance as those lying along the Trinity river, near the cities of Fort Worth and Dallas, Texas. They have been practically the only source of concrete aggregate, railroad ballast, paving material and plastering sands for these cities and the territory within a hundred miles or so, for the soft limestones of this region are in thin ledges and produce only limited amounts of material suitable for the purposes mentioned. The great growth of Dallas and Fort Worth has been in recent years, since concrete became a favored building material, and the availability of cheap and good aggregate combined with locally made cement has caused concrete to be freely used in the building of these cities. Dallas contains some buildings of reinforced concrete that are known to architects the world over, because they were among the first of really modern buildings to be built of this material. The Medical Arts building, the Maple Apartments and the Santa Fe building (said to contain 3600 carloads of washed and screened gravel) are among these examples. It is doubtful if such splendid structures would have been built if it had not been that the materials could be obtained locally and at a reasonable price.

A typical gravel face near Grand Prairie

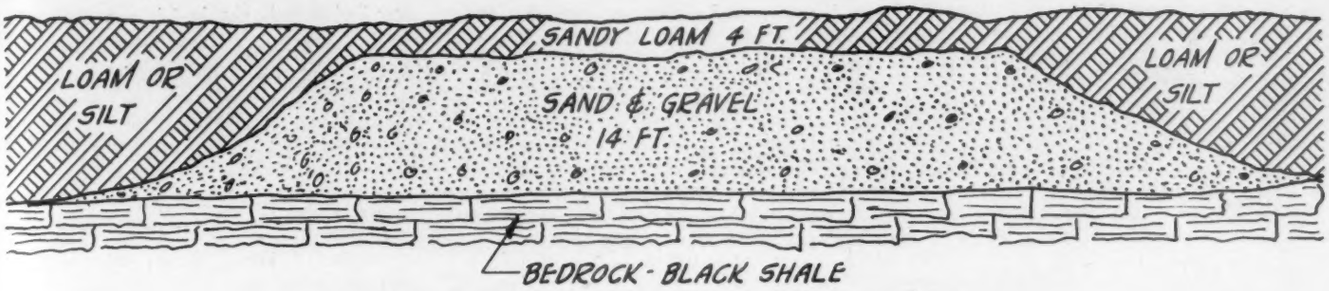
Extent of the Deposits

The known field extended about 46 miles from a point near Fort Worth to Hutchins, which is on the Trinity and 16 miles south of Dallas. All the deposits lie within a mile of the river, on one side or the other, and this two-mile strip is about the width of the river bottom. Few of the deposits are cut by the present river channel. A number of deposits are 600 or 700 ft. from the river. Not all the river bottom contains workable sand and gravel by any means. The deposits are well defined areas, and outside these areas the bottom land is black loam or clay clear to bedrock. The gravel can only be found by prospecting and prospecting has an importance in this field that it has not reached in any other of which the writer knows. Some of the larger companies keep an engineer constantly employed in prospecting, especially at the present time when it is realized that the supplies of gravel and sand close to railroads are running short, and that it will be well to accumulate reserves as soon as possible.

Character of the Deposits

The sketch shows a typical section of a deposit near Grand Prairie, about 16 miles from Dallas, and near the Dallas-Fort Worth highway. The concrete in some thirty odd miles of road slab on this highway is an excellent example of the value of these deposits, as the traffic on it is about as dense as

Old cutting through the Gifford-Hill deposit. The gravel goes about two feet deeper than the bottom shown



Typical section through Trinity river sand and gravel deposit

on any highway of its length in the country. Land abutting the highway is said to be worth $1000 an acre or more anywhere along its length. Elsewhere the price varies to about $150 an acre as the minimum. When it is remembered that only about 20,000 tons per acre is recoverable, and that usually a lot of ground that contains no gravel has to be bought to secure the deposit, it can be seen that the cost per ton in the ground is not a negligible figure. The system of working leaves the ground of no value for agricultural purposes or for building, for it is left in a series of hills like little mountain chains where the stripping has been side cast. Ultimately it may possibly be recovered by the same system that has been used in the Tennessee phosphate fields, by cultivating the tops of the ridges and allowing the work and the rains to fill in the hollows, but at present the land is not worth the trouble of doing this.

Bedrock near Grand Prairie lies 18 ft. to 18 ft. 6 in. below the surface and it is a black shale so soft that care has to be taken not to dig it with the bottom gravel. The gravel rests on this to a depth of 14 ft., the lower 2 ft. being under water. Above this is about 4 ft. of soil, usually a sandy loam.

Variation in Local Deposits

At the edges of the deposits the gravel tapers off as shown in the sketch. In some places it runs off in as little as 50 ft. (about as shown in the sketch); in other places it may run as far as 500 ft. before going out altogether. But usually when it begins to get thin, work ceases for the overburden rapidly gets too heavy to remove profitably.

Near Fort Worth the deposits are deeper and the gravel is coarser. The deposit the Fort Worth Sand and Gravel Co. was working when it was visited recently had 30 ft. of gravel with about 2½ ft. of stripping. It appeared to be all gravel as it came up in the dragline bucket, but it contains almost enough sand for use as concrete aggregate. The company has a crusher in its plant that is kept reasonably busy crushing oversize (plus 2-in.).

There are other local variations as to the depth and character of the material. The Dallas Washed and Screened Gravel Co. works a deposit near Arlington which, at the time it was visited, contained 9 ft. of gravel under 12 ft. of stripping. As the gravel is of excellent quality, it could be worked at a profit. The deposit, the method of working and the plant were described in Rock Products, issue of February 20, 1926.

Near Eagle Ford the deposits have about the same depth of overburden as at Grand Prairie, but the material is much finer in grain. Practically all of the deposits worked in that section produce only pea gravel and sand. Generally speaking, sand is deficient in the deposits near Fort Worth and in excess in the deposits near Dallas, although this does not apply to every individual deposit. But the fact that sand is said to bring a higher price f.o.b. plant at Fort Worth than at any other place in the United States shows that it is rather deficient than abundant there.

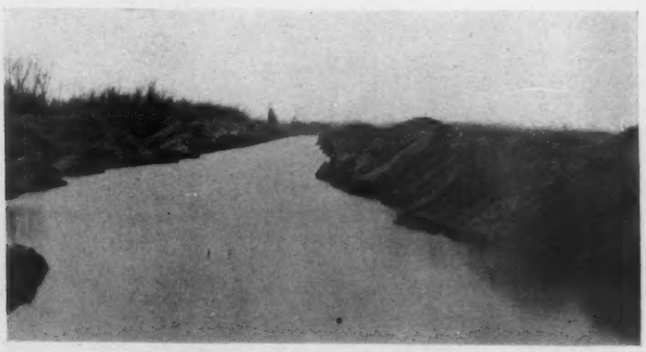
The deposits at the western end of the field are not only deeper and of coarser material, but the same characteristic is noted of individual deposits, that is, the western end of almost any one of them has more gravel and the pebbles are somewhat larger. Not all deposits show this as plainly as others, but it is said that imperfect prospecting has caused some deposits to be overestimated, as only the best (the western) end of the ground was drilled. The fact that the coarser material is found to the west is a fairly good indication that the deposits were laid down by a flow of water which ran from west to east, as the Trinity river now flows.

Sources of Deposits

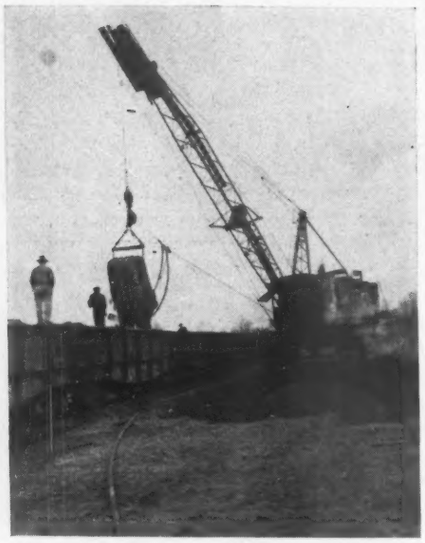
But knowing this, one wonders what could have been the source of so much material since there are no mountains or even hills of any size to the west of the field and the deposits are too far from the glaciated area to admit any movement by an ice field. Moreover, the shells and other fossils found in them show that the material was brought to its present situation in quite recent times, long after its emergence from the sea of Cretaceous geological period which covered so large a part of Texas.

Dr. E. H. Sellards, head of the geological department at the Texas State University, was asked if he could explain the origin of these gravels, and he answered that such evidence as had been accumulated pointed to an origin quite unlike that of any other important gravel field of which the writer knows. He said that in the Pennsylvania geological period there were great land masses to the east of the present field. The drainage at that time was from east to west, the opposite of the direction of drainage at present. The land masses were eroded and

Worked gravel is left in such shape as to be unfit for building sites or farm land



Worked out land near Grand Prairie. The plant shows in the extreme distance



Loading pit-run railway ballast, Gifford-Hill deposit

made sand and gravel which was carried to about the present position of the deposits or perhaps a little to the west of them. Then there followed the submergence in the sea of Cretaceous time, and after the land emerged the gradient was changed so that the newly created streams flowed from west to east as they do today. River terraces were formed of these old gravels and sands and cut through and the material was often taken from one place and moved short distances to another. Local rocks disintegrated, especially limestone rocks, and added their quota of pebbles. Silt and loam from recent erosion filled the spaces between the gravel beds (which were left as old channels) and at last the deposit was left much as it is today. And as these bottom lands are often flooded and the old river channels show that the river has flowed in various parts of the bottom in quite recent time, it is possible that there is still some sorting and moving of the material, although it proceeds at a rate so slow that it cannot be noted in the span of an ordinary lifetime.

Pebbles picked out of the face of the deposit are largely of limestone, but these are hard, fine grained sandstones, quartzites, flints and occasionally a piece of chalk. Chalk has been an impurity that has given trouble in some parts of the deposit, in fact. Black flints polished until they looked like cut jet show prominently, and there are many shells, most of them worn until they resemble pebbles more than shells. These shells, Dr. Sellards says, are of Cretaceous time.

Size of Deposits

The tonnage contained in one of these local deposits may be anything from a few thou-

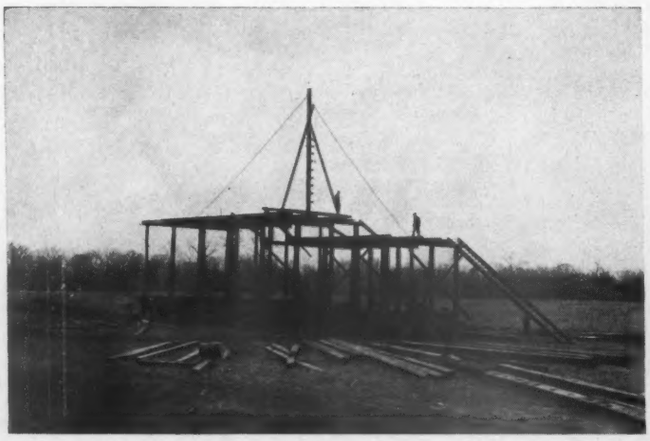
Open storage over a belt in concrete tunnel at the new Gifford-Hill plant

sand tons up. About the smallest that the writer heard of as being worked commercially were two deposits near Hutchins which were dug out for railway ballast. One contained 200,000 yd., the other 205,000. Such deposits could not justify large scale working and a washing plant. A typical deposit, for the Grand Prairie region, at least, is that now being worked by the Gifford-Hill Sand and Gravel Co. of Dallas, which the writer was given every assistance to examine with the information which the company had already acquired in prospecting it.

The deposit is a fairly regular ellipse 3000 ft. on its longest diameter and a little less than half that on its shortest diameter. It is everywhere level except for the fall of the country, which is 8 to 10 ft. to the mile, and it is about 495 ft. above sea level.

This deposit contains uniformly 14 ft. of gravel and 4 ft. of overburden, and it was prospected by putting down holes with a 10-in. auger on the corners of squares 210 ft. each way. At every other hole a test pit was dug so that the engineer might get down into it and examine the material. The lower 2 ft. of the deposit was under water, and when water was reached a casing was driven and the auger was worked in the casing. From the borings a map was made showing the amount and character of the gravel at every hole. A considerable part of this material has been dug and shipped for railroad ballast, and the records of shipment and measurements of the excavation (which is measured by the engineer each week) check closely with the map. Final calculations showed that the deposit con-

Finishing the concrete track hopper, new Gifford-Hill plant



Left—A side view of the new Gifford-Hill plant and right—the building of the settling pond levee at the plant

Looking over the Gifford-Hill deposit

Offices and employes' quarters, Gifford-Hill deposit

tained about 2,000,000 cu. yd. of workable material.

Prospecting Deposits

The prospecting work was in charge of T. E. White, an engineer of the Gifford-Hill company, who took the writer over the deposit and also over a lot of the surrounding country which he had tested without finding a workable deposit. He pointed out that there are certain surface indications that are important. Where there are low places in the land that showed as black streaks in the sandy soil it is useless to look for gravel, as the auger has never found any under such a place. A distance of 600 ft. from the river is the likeliest place for a deposit to be, although he mentioned one deposit that actually cut by the river and another close to the red clay-gravel hills that confine the bottom. These clay-gravel hills are already being worked for road gravel, and it is possible that they may furnish some aggregate when the river bottom deposits are exhausted.

This ground is now being worked for pit-run material which is sold as railway ballast. It is dug with a class 14 Bucyrus dragline with a 2-yd. Page bucket, loaded into cars and sent to the yard which the railway maintains for its gravel business in that part of the field. It is expected that about half the deposit will be excavated and marketed in this way, and that the remainder will be put through a washing plant which is being erected as the notes for this article are made.

Face of gravel on the Farrell deposit where the gravel is about 30 ft. deep.

Operations Adapted to Character of Deposits

As Mr. Hill pointed out to the writer, 1,000,000 yd. of available material does not justify a large investment in washing plant equipment, so first cost has to be kept down. At the same time the plant and equipment has to be adequate to produce 1000 tons daily of well washed and screened material, and do it at a reasonable cost of operation, has made something of an engineering problem. One method of saving expense adopted is to use open storages instead of bins, placing the storage piles over a tunnel which contains a belt conveyor. This allows the plant to be placed on round poles, not only cheaper but stronger than square timbers for the same cross-section. Link-Belt screens and sand separators are to be installed and the feed to them comes from an inclined conveyor that starts from under a concrete track hopper of the usual type.

The river is at a considerable distance from the plant, and to conserve water and provide a settling place for the fine sand and silt wasted, a settling basin is being built. This was done by the usual method of throwing up a levee, about 12 ft. high, of dirt which was taken from inside the settling basin. A Pawling and Harnischfeger gas-driven dragline with a ¾-yd. bucket did this work.

The principals in the Gifford-Hill company are experienced and successful operators of sand and gravel plants. They have another plant in the Grand Prairie region, one in Texarkana, Ark., and one in Forrest Hills, La. In addition they have worked smaller deposits in the Trinity bottom for pit run to be sold as railway ballast. The care and skill they exercise in prospecting ground and adapting the plant to the deposit are not usually found in those who open new gravel deposits. At the deposit spoken of they maintain an excellent boarding house and sleeping quarters for some of the men, and there are repair shops in which they can handle any ordinary repairs to draglines and locomotives. They have a number of draglines and six 40-ton locomotives, besides other equipment in the Grand Prairie district.

The Alternative Method of Operation

The foregoing paragraphs describes one method of working. The alternative system is to build a large plant and to bring the material to it by standard-gage equipment from whatever distance is necessary, and this is the method that has been chosen by H. B. Farrell. He is building a plant near Irving, Texas, that is said will be the largest in the Trinity field. It employs Link-Belt machinery throughout and more or less resembles the typical plant constructed by that company, although it was designed by H. P. Inge, engineer for Mr. Farrell. Mr. Inge was formerly at the head of the Inge Construction Co. of Dallas, and knows the uses of the material as well as how to recover it.

Mr. Farrell has one of the largest, if not the largest, deposit which has been proven to contain good gravel throughout its whole area, in the entire Trinity field, and this is the reason why a plant of so large and permanent a nature has been built. The deposit is considerably deeper than the deposits at Grand Prairie, although it is only a mile or two from there; and the gravel is coarser, enough so that it was a question being discussed, while the writer was at the plant, as to whether a crusher would pay or not. So long as the market is good for cobbles

Dragline on H. B. Farrell's ground

The Farrell deposit showing the new plant in the distance

it would not pay, but space has been left for the installation of a crusher if desired.

This same system, that of establishing a large central plant and bringing the material to it from whatever deposit is being worked, is that which the Fort Worth Sand and Gravel Co. has adopted. The plant itself is on the edge of the city and near some deposits which are being stripped as the notes of this article are made. A class 24 Bucyrus dragline with a 5-yd. dipper was doing the work. But the material washed and screened in the plant came from deposits belonging to the company 11 miles distant. In the particular portion being excavated at the time there was 30 ft. to 35 ft. of gravel, about half under water. The sand content of the bank run was low and there was only a small amount of oversize, an almost ideal feed for the washing plant, and containing very little clay.

For digging the bank material a Monighan "walker" dragline of the latest type is used,

Large bucket used in gravel digging, Fort Worth company. The gravel here is about 35 ft. deep

and it digs gravel as cheaply as any machine in the field. It is powered with a Fairbanks-Morse Diesel engine and the fuel cost is only $3 per day.

The Fort Worth plant, which is at present the largest operating in the field, is a "Telsmith" plant throughout, the Smith Engineering Co. designing it as well as furnishing the equipment. It was described in detail in Rock Products, August 7, 1926.

Other companies whose operations have been already described in Rock Products are those of the Dallas Washed and Screened

Dragline digging gravel at the Fort Worth company's pit

Gravel Co. (February 20, 1926) and the J. Fred Smith Gravel Co. (October 1, 1927). The plants already mentioned are all railroad shippers doing some trucking incidentally, except the Fort Worth company, which makes most of its city deliveries by truck. But there are a number of smaller companies using truck altogether. The most important of the truck operations are those of Vilbig Bros. and J. Lee Vilbig, really the same company, who supply most of the washed and screened material trucked into Dallas. These plants are said to be among the model trucking operations of the country.

Some Excellent Pit-Run Aggregate

Besides these there are the pit-run producers. The words "pit-run" makes the legitimate producer shudder, as he thinks of some of the dreadful stuff that has been sold to the public from farm yards and wayside pits. But there are grades of pit-run as in other things, and it must be admitted that some of the pit-run produced from the Trinity deposits is about as good concrete aggregate as a washing plant could turn out. It is not dirty, the clay content is low and there is no organic matter in sufficient quantity to disintegrate the concrete; and the natural grading is excellent. The sand and gravel producers use it in their own construction work and one of the Dallas cement companies used it for building silos, and made excellent concrete from it. Such pit-run material is a legitimate concrete aggregate, and one can hardly quarrel with those who sell it, or those who use it.

Not All Pit-Run Is Good

However, not all the pit-run material offered for sale in Dallas and Fort Worth is of this quality; and it is unfortunate for the sand and gravel industry that the good kind can be produced and sold. Evidences of the use of poor pit-run sand and gravel are said

Dragline with 5-yd. bucket stripping new ground, Fort Worth company

to be fairly abundant in some places, where it has been used for sidewalks and curbings. The public is beginning to realize that it is better and safer to use washed and screened material. Even those who produce pit-run

material do not expect to remain in the business permanently. One of the heads of these companies told the writer, "The good pit-run material is about all gone, and when our deposit is exhausted we will go out of the business, for we do not want to sell the other kind."

Exhaustion of Accessible Resources in Sight

As a matter of fact the whole field is showing signs of exhaustion, if only the deposits near the railroads are considered available. One large producer said he expected that three years would make a great change in the industry; as so many of the deposits now being worked would play out by that time. The Fort Worth Sand and Gravel Co., as has been mentioned, is already shipping in material from deposits 11 miles away. Other companies may be doing the same thing in effect before very long. Of course, in such an immense area there is still plenty of gravel resources, but it will require the building of railroads to get to them.

Another change that may come to the field before long is the use of movable plants in working it. These must not be confused with portable plants, intended to be set up on a small deposit and then taken down and moved to another. The movable plant is part of a method for working a large area systematically and on a large scale. It is already in use in the fields of Colorado county, Texas, near Columbus and Eagle Lake, and the first plant of this type was being tried out in the Trinity field when I visited there recently. If this trial proves a success undoubtedly more of such plants will be in use.

Producers in the Trinity Field

A list of producers in the Trinity field includes the following:

Fort Worth Sand and Gravel Co., 103 Seventh street, Fort Worth.

Gifford-Hill and Co., North Texas building, Dallas.

J. Fred Smith Gravel Co., Southwest Life building, Dallas.

Dallas Washed and Screened Gravel Co., Santa Fe building, Dallas.

Penniman Gravel and Martial Co., 3000 Junius street, Dallas.

G. W. Kenney, Athletic building, Dallas.

Cooper-Story Co., Prescott building, Dallas.

Trinity Gravel Co., Kirby building, Dallas.

The following are all on the Eagle Ford road, Dallas: J. O. Kinney, A. B. Murdoch Sand and Gravel Co., Murff Bros. Gravel and Sand Co. and Oak Cliff Sand and Gravel Co.

At West Dallas are: J. Lee Vilbig and Co. and the West Dallas Sand and Gravel Co.

Earl C. Smith is on the Grapevine road, Dallas, and the Trinity Farm Gravel Co. is at Record crossing.

H. B. Farrell is at Irving.

Building Increased in 1927, Contractors' Report Shows

THE greatest volume of construction work ever recorded for a single year was carried on during 1927, according to statistics just compiled by the Associated General Contractors of America. These figures, representing all types of construction activity, show 1927 to have outstripped 1926, its nearest rival among the years, by a comfortable margin, an increase of more than 4% being noted.

The new record, involving expenditure of approximately $8,000,000,000, was set despite a perceptible lag in activities during the first two or three months of the year. It early became apparent, however, that an unusual volume of contracts were being awarded and the advent of warm weather found operations assuming a rapid pace. Records for individual months were broken no less than six times during the year, new marks being set in April, May, August, September, October and November.

The close of 1927 found operations proceeding at the same rate they held in December, 1926. The concluding month of the year registered a decrease of 24% below the November mark. This drop, however, was not abnormal, being a seasonal one. The total volume of contracts awarded during the first 11 months of 1927 was 2% greater than the volume recorded during the corresponding portion of 1926.

Yardage of concrete surface pavement represented in awards made during the first 11 months of 1927 shows an increase of 16% over the total of awards made during the corresponding portion of the preceding year. The statistics included contracts for highways, streets and alleys.

Potash Mining in Germany and France

THE BUREAU OF MINES, Department of Commerce, has brought out Bulletin No. 274, Potash Mining in Germany and France, which in the view of the recent test drillings and potash explorations now under way in New Mexico and Texas, is of especial interest. The bulletin is based upon data obtained during visits to the German and French potash mining districts in 1911 and 1923, supplemented by information from various books and articles on the subject, the more important of which are listed in a bibliography accompanying the report.

The bulletin is largely confined to a discussion of the mining methods in vogue in France and Germany, in view of possible application of similar methods when mining of the deposits in the southwestern part of the United States is undertaken. It includes a brief history of the German and French potash industry, a discussion of the geology of the deposits, a short description of the refining of crude potash salts for export and an estimate of cost of production.

Several geologic maps of the principal deposits and illustrations are also given.

Copies are available upon application to the U. S. Government Printing Office, Washington, D. C., at 25 cents per each.

Fort Worth Sand and Gravel Co.'s plant at Fort Worth

A portion of the worked out area, Fort Worth company

Hints and Helps for Superintendents

Device for Distributing Stone in Bins

THE accompanying illustration shows a simple method of deflecting the discharge of chutes in crushed stone bins so that the stone will spread more evenly over the surface of the bin, and will not pile up at one side, as is often the case. Two pieces of strap iron, bent as shown, are bolted to an iron plate about 6 in. wide and 15 in. long. The irons are then securely fastened to the chute or to the side of the bin, in such a position that the plate is directly in the line of the discharge from the chute. As the stone comes down the chute, some passes over the plate and some strikes it and falls back, so that there is a fairly even distribution in the bin, with a considerable amount falling directly in the center of the bin. The idea was noted at the Riverside Lime and Stone Co., Lyons, Ill.

Distributing device prevents segregation in bins

A Simple Sand Classifier

THE H. E. WEST SAND CO., of Muskogee, Okla., uses a simple device for grading sand that is said to give very satisfactory results. It is made up of three square hoppers set in series, each hopper provided with a valve which can be regulated by a rod and lever attachment. The feed to this surface current classifier (which is what it really is) comes from a dredge in the Arkansas river. At times all of the sand but a little of the fines will do for concrete sand, and at other times a considerable quantity of fines must be removed.

The three hoppers being in series, the first takes out the coarsest grains, the next the medium grains, and the third the fine grains. The finest grains go out in the waste water. If the sand is coming coarse, all three hoppers discharge into the car; if it is coming fine, only the first and second hoppers so discharge, and if it is coming very fine the discharge from the first hopper is all that can be loaded.

The picture was taken on a dark day and the details are not clear. What looks to be a cone under the hoppers is really a broad triangular chute which can catch the discharges of the three hoppers. The cone that shows in the trees at the rear is one which was discarded after experimenting with it. Mr. West made a great many experiments with settlers and screens before he decided to use the simple device which is shown here.

Simple device for grading sand

Shovel and Transportation Efficiency in Stripping

T. WARREN ALLEN AND ANDREW P. ANDERSON, of the U. S. Bureau of Public Roads, Washington, D. C., have published in the government monthly bulletin "Public Roads," for February, the results of their observations on "Power-Shovel Operation in Highway Grading." This operation is very similar to that of quarry and gravel pit stripping, and an abstract of Messrs. Allen's and Anderson's findings should therefore be of general interest to rock products operators.

"In ordinary common excavation four or more feet in depth, which is dug easily and dumped freely, a good power shovel in good condition can load vehicles at the rate of four dipper loads per minute, providing the vehicles are so placed that the average swing does not exceed 90 deg. A good operator can continue this rate for intermittent periods throughout the day. To attain this rate it is necessary to load the dipper in about 4½ seconds, to swing and spot the dipper in about 4 seconds, to dump it in 1½ seconds, and then return the dipper to the loading point in about 5 seconds. Many jobs have been found where this rate has been maintained during intermittent periods of varying length under the conditions given above, and it may therefore be taken as the maximum attainable with present-day power shovels worked under favorable field conditions. However, numerous jobs have been found where the average rate of all-day shovel operation, in good common, was at the rate of three or more dipper loads per minute, and this may therefore be accepted as a criterion of good operation under normally favorable field conditions. If the operator is forced to swing his shovel 180 deg. instead of 90 deg., his best possible short time output will be only about 3 1/6 dipper loads per minute with a very fast swinging shovel, while his all-day average rate may readily be much less than 2½ dipper loads per minute.

"In ordinary common excavation three or more feet in depth the average dipper load for a ¾-yd. shovel should be about ½ cu. yd.

of material as measured in place. A 1-yd. dipper should average about 0.7 cu. yd. In some materials which heap up on the dipper and do not spill on the swing, the average load will sometimes equal the rated capacity. In poorly blasted rock or shale, or in material full of roots and stumps, the average dipper load may be 40% less than the general average for ordinary common excavation or about 0.3 cu. yd. for a ¾-yd. dipper.

"The custom of loading the hauling units at the rear of the shovel (180 deg. swing) is a very expensive practice. Even with a fast-swinging shovel, loading at the rear of the shovel instead of at the side will increase the time required for each dipper load about 4 seconds, and if the shovel is of slow-swing speed it may be twice this amount. If the average time per dipper load is 20 seconds when loading at the side of the shovel, it will be somewhere between 24 and 28 seconds if the loading is at the rear. In other words, production will be cut from 180 dipper loads per hour to 150 or possibly as low as 128 per hour. Consequently, one of the essential requirements for high-shovel production is to so place the wagons or trucks that the swing of the shovel will be as short as possible.

"Except where the trucks were equipped with pneumatic tires no job has yet been found where trucks of 3- or 5-ton capacity could consistently maintain an average round-trip speed of over 8 miles an hour, or about 700 ft. a minute. Generally the speed has been below 6 miles an hour. Whenever the turning time in long short-haul work is long and the operating speed relatively low, the output of the truck can usually be considerably increased by backing the loaded vehicle to the dump and returning it forward to the shovel. Cases have been found where this method proved advantageous up to a haul of over 800 ft. On very short hauls the output of the truck can sometimes be almost doubled in this way.

Tractor-Drawn Bottom-Dump Wagons Found Efficient

"Bottom-dump wagons of 5 and 6 cu. yd. capacity drawn by crawler tractors have been found to be very efficient under a wide variety of conditions. Usually two of these wagons can be drawn by one good 10-ton crawler-type tractor. A good tractor operator can handle one of these trains effectively under conditions encountered in ordinary work. While the operating speed is rather low—about 275 to 325 ft. per minute—the dumping and turning time is low, so that two of these trains can ordinarily handle the full output of a ¾-yd. shovel up to a haul of from 600 to 800 ft. in good common excavation, and to a correspondingly greater distance in material which is more difficult to dig. Each additional train will extend the hauling distance by from 800 to 1,000 ft.

"Where crawler tractors are used to draw large dump wagons, only skilled operators who will take an interest in the work should be employed.

"Three cases were studied where the operators in a laudable effort to secure a large yardage per dipper load had replaced regular ¾-yd. dippers with 1¼-yd. dippers. This proved a decided handicap, except possibly in extremely soft and easy digging, as the power was insufficient to force the large dipper into the material. Not only was the production less than the normal for a regular ¾-cu. yd. shovel, but time losses due to breakage and repairs was high. This seems to indicate that for general work increased production is not to be had by increasing the size of the dipper above that for which the shovel is designed.

Definite Loading Rules Not Possible

"Definite rules cannot be formulated since each operation is interrelated with many other possible conditions surrounding the entire job. It is possible to show the principles which apply and by means of which the proper procedure can be determined. It has been stated that the importance of securing a full dipper load is greatest when the time required to load the dipper is in smallest ratio to the total shovel cycle, and vice versa. Therefore, more attention to securing a large dipper load is justified when loading at the rear of the shovel than when the loading is at the side. In shallow cuts, where much skimming is required, dipper loads are almost certain to average a low quantity. Keeping the boom lower than normal will generally help in securing larger loads."

NUMBER OF DIPPER LOADS AND QUANTITY OF MATERIAL MOVED UNDER VARIOUS CONDITIONS

Type of shovel	Capacity	Character of material	Quantity moved	Dipper loads	Average loading
	Cu. yds.		*Cu. yds.*	*Number*	*Cu. yds.*
Steam	¾	Light moist clay, free from roots and stones.	57	147	0.39
Do	¾	do	114	223	.51
Do	¾	do	85	170	.50
Do	¾	Light moist clay, with some shale	65	148	.44
Do	¾	Loamy clay, with 25 per cent loose rock	19	50	.38
Do	¾	do	63	156	.40
Do	¾	Sand-clay	49	82	.60
Do	¾	do	93	150	.62
Do	¾	Loamy to hard clay	49	85	.58
Do	¾	Loamy to sandy clay	50	141	.35
Do	¾	Loamy to clay	60	157	.38
Do	¾	do	39	72	.53
Do	¾	Gneiss-granite, poorly blasted	985		.33
Do	¾	Wet sticky clay, with a few stumps	1,167	1,745	.67
Do	¾	Moist to wet sand-clay	1,468	1,825	.80
Do	¾	Sandstone, well blasted	219	632	.35
Do	¾	do	1,120	2,599	.43
Do	¾	Moist clay, with a few small surface bowlders.	518	794	.65
Do	¾	Very wet clay	588	990	.59
Do	¾	Wet clay, with small stumps	100	210	.48
Do	¾	Sandy gravel, with some hard chunks of shale.	1,683	4,099	.41
Do	¾	Dry loamy clay	162	309	.53
Do	¾	do	29	71	.41
Do	⅞	Granite-gneiss, poorly blasted	1,335		.40
Gas	¾	Loamy clay, moist, with a few roots	356	583	.61
Do	1⅛	Sandstone, blasted	1,840	3,448	.53
Do	1⅛	Dry clay, with a few bowlders	1,523	2,892	.53
Do	1⅛	Dry clay, with surface bowlders	635	996	.64
Do	1⅛	70 per cent large bowlders and 30 per cent dry clay.	381	667	.57
Do	1⅛	10 per cent dry clay, 20 per cent loose rock, 70 per cent solid rock, blasted.	2,759	4,384	.63
Do	1⅛	Wet sticky clay, with a few surface bowlders.	1,364	2,396	.57
Do	1⅛	20 per cent dry clay, with 80 per cent sandstone, well blasted.	474	784	.60
Steam	¾	Sandy clay and clay loam, with some stone.	1,555	3,504	.44
Gas	¾	80 per cent sandstone, poorly blasted, with 20 per cent clay.	363	788	.46
Do	¾	do	3,010	6,646	.46

TIME REQUIRED TO LOAD DIPPER IN VARIOUS KINDS OF MATERIAL. EACH ENTRY SHOWS THE NUMBER OF ONE-HOUR STUDIES IN WHICH THE AVERAGE TIME OF LOADING FELL WITHIN THE RANGE INDICATED. STUDIES WERE MADE ON A GREAT MANY TYPICAL JOBS

Average time to load dipper (seconds)	Loam, loamy, sandy, gravelly, or friable materials, practically free from roots, bowlders, etc.	Ordinary clays, ordinary soils, and friable materials with few roots or loose rock, etc.	Fairly hard or tough clays, ordinary clay with some loose rock, shale, etc.	Mixtures of clay and loose rock, soft shale, and hard and tough clays, etc.	Well-blasted rock, shale, etc.	Fairly well blasted rock, loose rock and bowlders, hard or tough clay with rocks, etc.	Clay-gravel in 6 to 9 foot cut with 2 feet of hard frost on surface.	Poorly blasted rock or shale, bowlders, hardpan, etc
3 to 4	1							
4 to 5	7							
5 to 6	18							
6 to 7	2	18						
7 to 8		12						
8 to 9		5	11					
9 to 10			13		6			
10 to 11			26	6	2			
11 to 12				21	4			
12 to 13				11	9			
13 to 14				7	5		3	
14 to 15					9		2	
15 to 16					3	4	1	
16 to 17					2	7	1	
17 to 18						10		1
18 to 19						7	4	
19 to 20						6		3
20 to 22						1	2	9
22 to 24								3
24 to 26							1	7
26 to 28								4
28 to 30								1
30 to 35								
35 to 40								2
Average time of loading in seconds	5.2	7.1	9.7	11.9	12.4	17.6	17.4	23.9

Changes Undergone by Cement Materials Along the Length of a Kiln

Examination of Materials in Various Positions Throughout the Kiln and Waste Heat Plant

By Alton J. Blank and W. B. Williams
Chief Chemist Construction Engineer
La Tolteca Cia. de Cemento Portland, Tolteca, Hgo.

IT IS SELDOM that the operation of a rotary kiln is abruptly stopped, either through mechanical or other difficulties. In the rare occasions when this occurs unusual opportunity for an interesting general study of the materials throughout the length of the kiln is afforded. This examination often yields valuable information regarding the kiln performance and its operation.

Recently, the breaking of a cradle roll support on the smaller of the three kilns at our plant made the rotation of the kiln an impossibility and forced us to close it down to make repairs. The suddenness of the shutdown allowed the opportunity for the study presented below to be made, for the position of the material in the kiln throughout its length remained so as to represent actual operating conditions.

Some time after the forced shutdown of the kiln it was possible to enter it for the purpose of studying the lining, coating and to collect samples of the material. Although there had been a continuous falling off of small patches of the kiln brick coating during the cooling process, by collecting the samples of the material near the bottom part of the mass, this contamination was eliminated from the samples to a certain degree.

The kiln had originally been lined with 9-in. clinker block for a distance of 64 ft., starting from the feed end. The following 39 ft. was lined with 6-in. fire brick and the remaining 29 ft. with 6-in. high alumina brick followed by a 6-in. concrete nose ring for 3 ft.

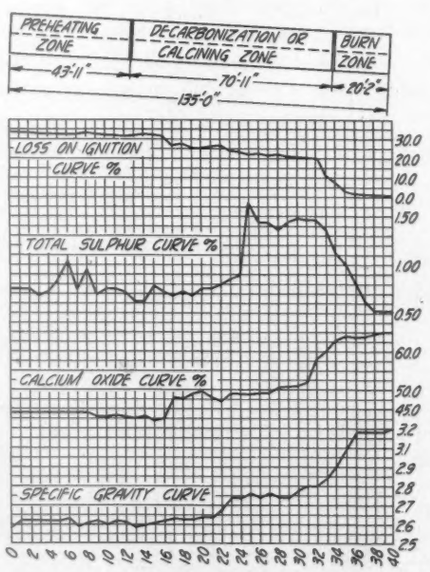
Examination of Kiln Coating

Examination of the coating on the kiln brick starting from the feed end of the kiln showed a coating of raw mix from 1 to 2 in. in thickness for a distance of 60 ft., this gradually increasing in thickness to 3 in. at a distance of 85 ft., from which point to a distance of 115 ft. the coating had a semi-fused appearance and reached 8 in. in thickness. The remaining length of the kiln to the discharge end had a well fused coating which varied in thickness from 8 to 12 in.

Samples of the material in the kiln were taken at intervals of approximately 40½ in., starting with sample marked No. 1, which was taken at the feed end and ending with sample marked No. 40, which was taken at the discharge end.

In the above and the text which follows, the places along the kiln from which samples were taken will be designated as position numbers, i. e., position No. 25 indicating a position 25× 40½-in. or about 85 ft. from the feed end.

In sampling the kiln it was observed that samples starting with position No. 1 consisted of ordinary raw mixture which became more dense and packed until in the vicinity of position No. 25 soft lumps had begun to form. From position No. 25 the material examined contained more and more of these soft lumps until at position No. 34 lumps slightly hard had begun to form. From position No. 34 the material was composed chiefly of hard semi-burned clinker which at position No. 37 became a well burned clinker.



Analysis of materials at different positions along the length of the kiln

Condition of Materials Within the Kiln

Examination of the samples taken showed that from position No. 1 to position No. 25 the material was yellowish in color, this turning to a dull grey at about position No. 34, from which point the material became light brownish, which gradually turned to a brownish-black color at position No. 40.

Analysis of the materials shows that from position No. 1 to position No. 37 in the kiln the total sulphur content is present in part as sulphur sulphide. Samples No. 37 to No. 40 do not show any sulphur present as sulphide.

It may be well to state that our average raw mixture contains in the neighborhood of 0.60 to 0.75% of sulphur as calcium sulphate, and that the Mexican topped crude oil as burned in the kilns has a total sulphur content of from 4.0 to 7.0%.

Examination of the kiln curve shows that at position No. 24 there is an abrupt increase in the total sulphur content of the material, which remains high until position No. 32 is reached, where there is a sharp decline in the sulphur content. This condition in itself is of great interest, it being of a somewhat extraordinary occurrence. From the above the following assumptions are drawn:

1. Incomplete combustion of the fuel oil tends to create a reducing atmosphere at this point of the kiln and the material is in such a condition at the prevailing temperature that it has a high affinity for the absorption of sulphur from the fuel oil.

2. The high sulphur content in the material at this point may be due to a concentration of the sulphur content of the raw materials.

3. Concentration of sulphur in the materials at this point is due to the absorption of the sulphur in the fuel oil by the oxides of calcium and magnesium and that this sulphur is driven off near the discharge end of the kiln and again reabsorbed at the position No. 25 stage, there being a continuous condition in the kiln from position No. 25 to No. 40, viz., of the materials absorbing the sulphur from fuel oil and having this sulphur again driven off near the position No. 40 stage and reabsorbed at the position No. 25 stage, and this condition continuing on indefinitely in this cyclical fashion.

Further, the reason for no great concen-

tration of sulphur in the materials between position No. 1 to position No. 25 is due to the fact that the material is still mostly present in the carbonate form.

Since there is sulphur in both the raw mixture and the fuel oil, it is possible that it is absorbed by the oxides and the alkalies as a sulphate in the clinker and the dust leaving the kiln, for though the main product in the primary combustion of sulphur is the dioxide, it is practically impossible to avoid the formation of some trioxide.

Starting at position No. 32 on the kiln curves we find that the preliminary stage of the burning zone begins, as at this point we find an abrupt upward trend in the calcium oxide and specific gravity curves and a downward trend in the loss on ignition curve.

This kiln being operated in connection with a waste heat boiler system, samples of the material in the kiln dust chamber and from each of the dust collecting hoppers situated under the waste gas flue and waste heat boilers were taken, the final sample being taken from the base of the concrete stack through which the gas from the fan is discharged. The total distance from the center line of the feed end of the kiln to the center line of the concrete stack is 184 ft. The dust collecting hoppers under the waste gas flue and waste heat boilers are situated at more or less equal distances from each other.

Materials from Waste Heat System

Examination of the samples of material taken from the waste heat system beginning with the kiln dust chamber and continuing to hopper No. 16 showed the material to be of a yellowish color, while samples taken between hopper No. 16 and the concrete stack were bluish-grey in color. All samples taken were found to have their sulphur content present in part as sulphur sulphide.

It is interesting to note that, whereas, in the majority of cement plants the dust collected in the kiln housing and the waste heat hoppers is exceedingly low in lime constituents and high in clay constituents, in this particular case the dust is exceptionally high in lime constituents. Further, with the exception of the kiln dust chamber and hopper No. 1, where the lime constituents of the material is high, the sulphur content is also high.

TABLE I. ANALYSES OF MATERIALS ALONG THE LENGTH OF THE KILN

Sample No.	SiO_2	R_2O_3	CaO	SO_3	Ignition loss	Specific gravity
1	12.84	6.30	44.09	0.75	33.00	2.59
2	12.88	6.20	43.92	0.75	33.10	2.62
3	13.00	6.40	43.92	0.68	33.00	2.62
4	13.20	6.40	43.92	0.72	32.80	2.62
5	12.40	6.94	44.02	0.85	32.40	2.62
6	12.54	6.68	43.98	1.04	32.60	2.62
7	12.60	6.74	44.28	0.75	32.44	2.63
8	12.48	6.88	44.04	0.96	32.80	2.59
9	14.40	7.10	43.04	0.68	31.44	2.61
10	14.60	7.20	42.94	0.75	32.00	2.62
11	14.20	6.98	43.40	0.75	31.64	2.60
12	14.80	7.24	42.88	0.72	31.20	2.62
13	14.80	7.40	42.58	0.61	31.50	2.61
14	14.00	6.80	43.08	0.61	32.60	2.59
15	15.00	7.30	41.88	0.78	32.00	2.60
16	14.40	6.90	42.46	0.72	31.40	2.61
17	14.20	7.00	47.84	0.68	27.00	2.62
18	13.88	6.90	47.64	0.72	27.40	2.63
19	14.00	7.20	48.84	0.68	25.40	2.63
20	14.40	7.10	49.47	0.75	25.00	2.63
21	14.20	7.20	48.00	0.75	25.85	2.64
22	14.40	7.40	47.00	0.79	26.40	2.64
23	15.60	7.00	48.60	0.85	23.90	2.68
24	16.40	6.40	49.00	0.89	23.30	2.74
25	16.30	6.80	49.00	1.64	22.30	2.74
26	16.70	6.70	48.60	1.44	22.56	2.76
27	17.00	6.40	48.80	1.44	21.20	2.74
28	17.00	6.40	49.00	1.36	22.24	2.76
29	16.70	6.50	50.60	1.44	20.70	2.74
30	16.80	6.42	50.80	1.48	20.50	2.74
31	16.80	6.44	51.00	1.46	20.30	2.78
32	16.80	6.46	52.00	1.46	19.80	2.80
33	17.60	8.00	58.20	1.37	10.80	2.80
34	18.40	8.70	60.00	1.13	7.80	2.84
35	20.00	9.50	63.00	1.02	3.40	2.90
36	20.60	9.80	64.00	0.82	1.70	3.08
37	21.20	11.00	63.40	0.61	1.00	3.18
38	21.40	10.60	63.80	0.51	0.70	3.18
39	21.00	10.50	64.40	0.51	0.60	3.18
40	20.78	10.40	65.00	0.51	0.40	3.20

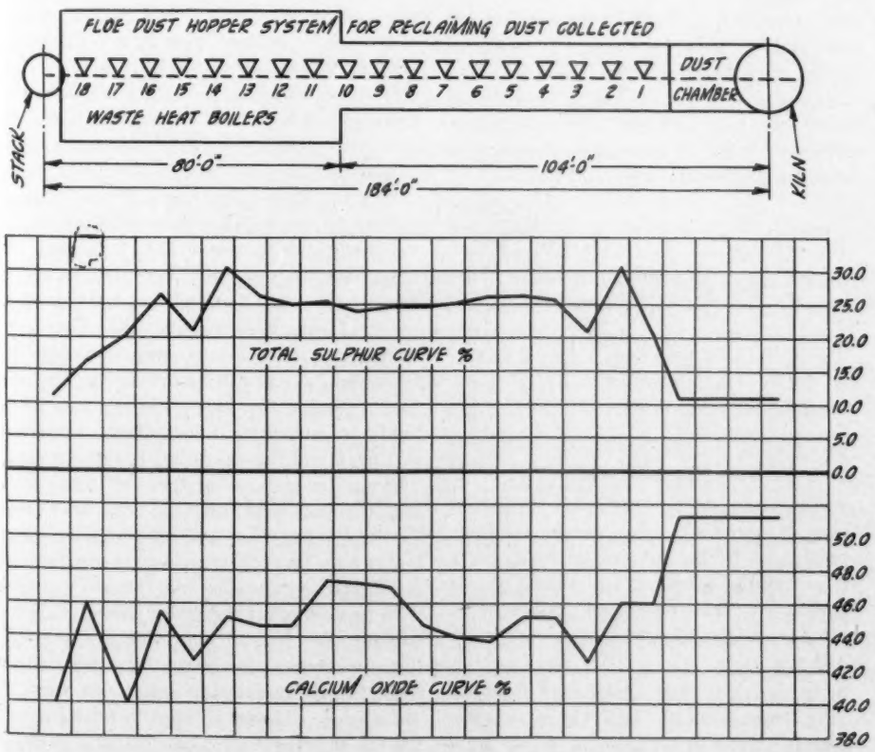
Between hopper No. 1 and hopper No. 16 the average loss on ignition of the materials is about 3.50%, while in the kiln dust chamber and between hopper No. 16 and the stack the loss on ignition averaged 10.70%.

TABLE II.—CALCIUM OXIDE (PLUS CALCIUM CARBONATE) AND TOTAL SULPHUR OF SAMPLES AT DIFFERENT PLACES

Sample	Calcium carbonate plus calcium oxide	Total sulphur
Kiln dust chamber	51.21	11.66
Hopper No. 1	46.00	21.43
Hopper No. 2	46.00	30.52
Hopper No. 3	42.53	21.43
Hopper No. 4	45.13	26.23
Hopper No. 5	45.13	27.44
Hopper No. 6	43.74	27.00
Hopper No. 7	44.00	25.21
Hopper No. 8	44.63	24.69
Hopper No. 9	46.87	24.35
Hopper No. 10	47.27	22.95
Hopper No. 11	47.27	25.30
Hopper No. 12	44.74	25.14
Hopper No. 13	44.26	27.44
Hopper No. 14	45.58	30.87
Hopper No. 15	42.53	21.95
Hopper No. 16	45.60	28.12
Hopper No. 17	40.10	21.09
Hopper No. 18	46.00	17.15
Concrete stack	40.10	12.69

This may follow the theory advanced for such a concentration of sulphur in the foremost part of the kiln near the burning zone. This assumption is that where there is a concentration of the material in the form of oxides the absorption of the sulphur from the gases is the greatest.

Average analysis of the materials between hopper No. 1 and hopper No. 16 is 40.40% calcium oxide and 8.6% of calcium carbonate. In the kiln dust chamber and be-



Analysis of materials in dust chamber, kiln gas flue and waste heat boilers

tween hopper No. 16 and the stack the calcium carbonate content of the material is much higher in proportion to the amount of calcium oxide present.

This would again tend to show that the sulphur in the gas is more readily absorbed by the materials having the greater part of their calcium present in the oxide form.

As is generally the case, it was found that the greater distance from the kiln the higher the alkali content in the materials, i. e., where in hopper No. 18 there was only 6.60% of potassium oxide, at the stack base the potassium oxide content had increased to 14.68%, or a potassium sulphate content of 32.7%. Future investigations along the above lines should yield more interesting information.

In the accompanying tables, Table No. 1 gives the chemical analyses and specific gravity of the materials sampled throughout the length of the kiln. The samples were taken at positions approximately 40.5 in. apart, starting at the feed end of the kiln. Table No. 2 gives the calcium oxide (plus calcium carbonate) and total sulphur determinations in materials taken from the kiln dust chamber, the 18 dust collecting hoppers situated under the flue gas runway and waste heat boilers and ending with the last sample taken from base of the stack.

A Mining Engineer Discusses Grinding in the Cement Industry

UNDER the caption, "Common Sense and Invention in Fine Grinding and Screening," John Herman, Los Angeles, Calif., in a letter to the editor of *Engineering and Mining Journal*, discusses grinding in the portland cement industry as follows:

"In portland cement grinding the aim is different. Little specific information is available on grinding below 200-mesh. It has often been stated that no successful screens have been made below 350-mesh, 'nor are they likely to be made.' I cannot agree with the last statement and expect soon to exhibit some screens, originally 200-mesh, electroplated with chromium to any desirable sized opening, as fine as 600-mesh would be, or as much finer as is practicable. The statement was often made that lack of certain specific information, such as 'How fine must portland cement be ground before it has hydraulic properties?' was largely due to a lack of practical fine-mesh screens. United States government sources of information mention 'a few pounds of 350-mesh laboriously screened by hand.' Manufacturers were unable to answer the question of how fine the cement had to be.

"My associates and myself screened portland cement so that we got a portion that passed completely through 200-mesh, and we tested the material between 200- and 300-mesh and between 300- and 350-mesh. Neither of these sizes had any hydraulic properties. Here we have portland cement that passes 200-mesh, and some that passes 300-mesh with no hydraulic properties. This same material reground has excellent qualities. We believe that only a small percentage of portland cement has any hydraulic qualities. Nearly all cement manufacturers meet specifications such as 80% or 90% through 200-mesh, and occasionally a 'flour meter' is used. It may be that well over 1000-mesh equivalent is required for hydraulic properties. We believe the value of portland cement depends not only on the surface exposed, but on the nature of that surface. It may be that there is also a low limit to the grinding for the proper hydraulic properties.

"There is another curious fact which does not seem to be fairly well known in the cement industry. If 'set' portland cement is ground enough to present new surfaces of the ground materials, this reground cement will set as firmly as the original, provided the regrinding has been carried far enough to produce new fractures instead of merely a bearing apart of old surfaces."

Effect of Surface on Adhesion of Plaster to Tile

IN CONNECTION with an investigation conducted at the bureau data were developed showing the effect of the type of surface on the adhesion of plaster to hollow clay building tile.

Three grades of tile (hard, medium and solt) were obtained with five types of surfaces (combed, grooved, wire cut, smooth and glazed). Each of these was plastered with a 1:3 gypsum-sanded plaster, a 1:3 cement-sand stucco, and a 1:3 cement-sand stucco with 10% hydrated lime. The specimens were tested at the age of 28 days and the following results were obtained:

Tile	Surface	Average adhesion Lb./in.²
Hard	Combed	15.0
	Grooved	15.6
Medium	Combed	15.9
	Grooved	13.2
	Wire cut	11.9
	Smooth	10.5
Soft	Combed	17.1
	Grooved	9.5

In all cases the plaster dropped from the glazed tile under its own weight.

As the only force ordinarily applied to plaster or stucco is its own weight (approximately 0.004 lb./in.² for a ½-in. coat), it is evident that the adhesion of plaster or stucco to hollow clay tile of all types is sufficiently great for safety, except in the case of a glazed tile.

A full report of this investigation appeared in the December 20, 1927, issue of the *American Architect.—Technical News Bulletin.*

Preventing Excess Wear in Crushing and Grinding Mills

WELDING A LAYER of Haynes "Stellite" to the wearing surfaces of cement mill equipment results in many economies of manufacture, says B. E. Field of the Union Carbide and Research Laboratories, in a recent article in *Chemical and Metallurgical Engineering*. Stellite is a cobalt-chromium-tungsten alloy which is unusually resistant to abrasion and is already well known to readers of Rock Products. Briefly, it is applied in a thin layer to equipment by welding.

Several examples of "stelliting" equipment are cited by Mr. Fields, among which is the Bethlehem three-roll mill, the alloy being applied to the inside of the ring. The links of drag chains handling cement clinker, edges and insides of the screws of the screw feeder carrying clinker to the grinding mills, the manganese steel blocks of roll crushers, the grinding ring of roll mills (Hercules, Bradley, etc.), catch plates above the rotary coolers, wearing parts of bucket conveyors and other equipment are listed as examples where "stelliting" would prove economical.

One interesting illustration of the savings accomplished through the use of stellite is given by Mr. Field as follows:

"One large cement company in the Bethlehem district has been conducting a very careful test on two mills of this type working side by side on the same material. A 'stellited' ring has been used in one mill and plain steel rings have been used in the other. Eight steel rings have been completely worn out and the ninth ring is now running, while the original 'stellited' ring is still in service without having been touched in any way. The life of this ring so far has been approximately 2100 hours and the mill has averaged throughout this period a production of 145 to 150 bbl. of pulverized material per hour.

"As the steel rings cost $210 each, their cost in the one mill has been $1890, whereas the 'stellited' ring cost $1150. It is apparent from these figures that the 'stellited' ring has not only paid for itself but has earned a profit of over $700 on first cost alone, not taking into consideration the labor cost of replacing the eight rings or the loss in production during the eight shutdowns; in addition, the mill using the 'stellited' ring has ground at full capacity throughout the test, whereas the mill using the steel rings has gone through eight cycles of decreasing production. When this 'stellited' ring does wear out it may be reclaimed at a comparatively small cost by building up the worn spots with more Stellite. Another Stellite application in this type of mill is on the faces of thrust washers in the arms which support the rolls, thereby preventing many shutdowns."

There is a large field of application of Stellite to other equipment, the article continues, particularly in the quarry industries.

The Portsmouth, N. H., plant of the Atlantic Gypsum Products Corp., just after completion. The hopper at the left was a temporary installation to receive rock gypsum from the crane reclaiming from storage. The transport line of the pneumatic conveying system shows at the right

Modern New England Gypsum Plant

Atlantic Gypsum Products Corp., Portsmouth, N. H., Has the First Pneumatic Conveyor for Raw and Calcined Gypsum Ever Installed for the Purpose

By H. J. Brown
Consulting Engineer, Boston, Mass.

SINCE the old plant of the New England Adamant Co., at Charlestown, Mass., a suburb of Boston, was destroyed by fire and the project at Red Beach, Me., ceased operations, Eastern New England has been without a gypsum manufacturing plant. Consumers in this New England territory have been supplied with gypsum products almost exclusively from the Western New York gypsum field, with, however, some supply coming from plants located in New Haven, Conn., and in the vicinity of New York City.

New England has kept pace with the increased use of gypsum products to such an extent that the time was ripe for the establishment of a gypsum plant at some advantageous location near where gypsum could be procured and manufactured at low costs. Accordingly, the Atlantic Gypsum Products Co. was organized in 1926 to develop the gypsum manufacturing industry of New England and to serve the Atlantic coast. A site was chosen on deep water at Portsmouth, N. H., on Freeman's Point, where during the World War the Atlantic Corp. built some 14 large steel vessels of 8000 tons register, many of which are still in operation for the United States Shipping Board. The company acquired also the plant and property of the Rock Plaster Corp. of New York; extensive raw material resources under lease at Walton, Nova Scotia; additional leases at Cheticamp, Cape Breton; while mineral rights to a very large deposit of high-grade white gypsum was purchased at Aspy Bay in Cape Breton.

Thus fortified with a goodly supply of raw material, the Atlantic company started the designs and broke ground for a new gypsum calcining plant at Portsmouth in July, 1926, under the writer's direction.

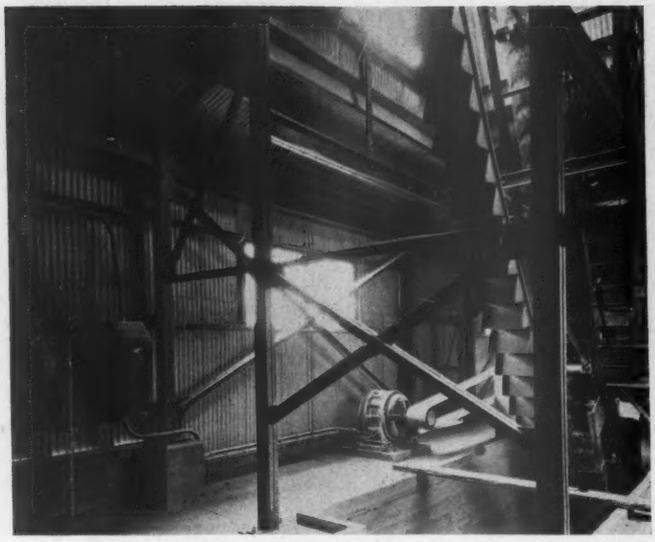
The work to be done was based on a careful analysis of territorial requirements and developments over a period of years, and the flow sheet here shown was drawn up as a guide for immediate as well as future construction. Since the flow sheet relates its own story, little or no descriptive matter is required to guide the reader in visualizing the plant in part or as a whole.

The calcining plant, while of an individuality all its own, contains many features similar to the plant at Chester, Penn., now owned and operated by the Pennsylvania Gypsum Co., which was also designed and built in 1914 and 1915 under the writer's supervision.

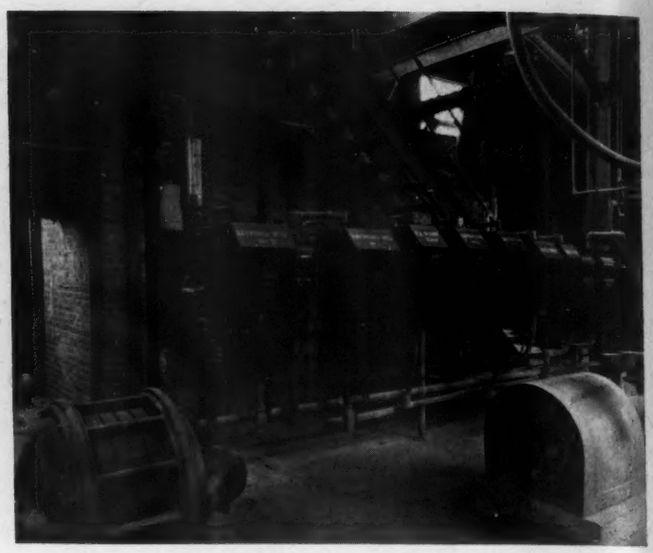
Unloading Facilities

Crushed gypsum rock is unloaded from the vessels by a pair of rebuilt portal cranes, originally constructed by the Brown Hoisting Machinery Co. of Cleveland, Ohio, which were a part of the shipbuilding plant. These cranes are equipped with Hayward and Brownhoist 2½-yd. clamshell buckets of heavy type and are capable of handling in excess of 300 tons of crushed rock per hour as now geared.

For the present, rock is stored in outside storage piles between the old shipways and is rehandled by similar portal cranes equipped with the same class of buckets into a bin over the belt conveyor which feeds the plant. This conveyor is of Robins type, 18 in. wide, with a 20x20-in. magnetic head pulley furnished by the Magnetic Manufacturing Co. of Milwaukee, receiving its 110 volts excit-



Inclined belt elevator carrying crushed gypsum from the roll crusher to the 400-ton silo storage. The photo was taken prior to installation of guard rails about the equipment



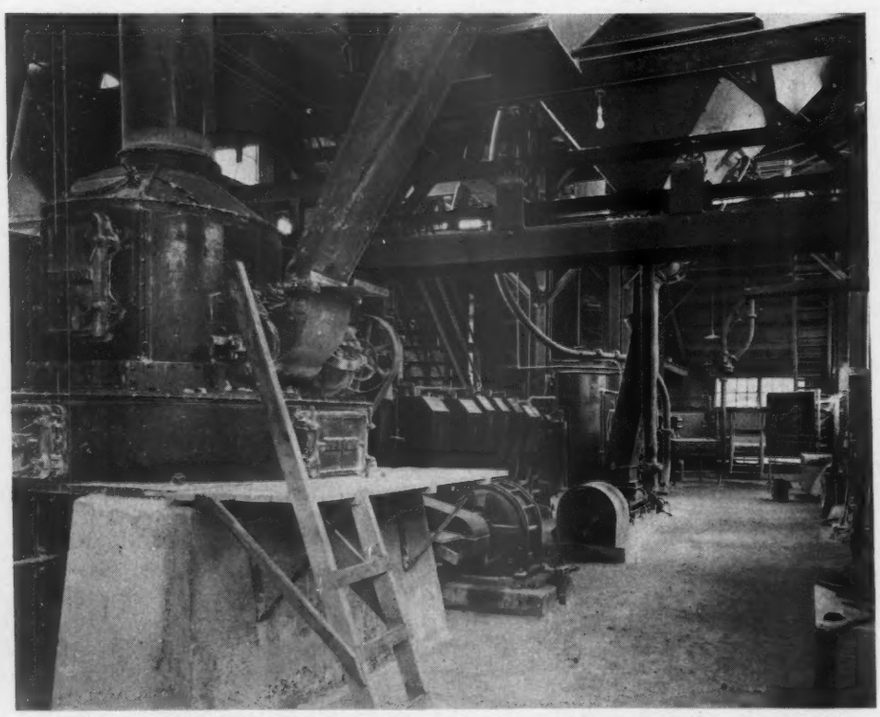
Dryer furnace and a group of motor controls in the mill room. The bend shown in the upper right is part of the pneumatic conveying system for carrying rejects back to the land plaster bin

ing current from a small direct-connected motor generator of 10 kw. capacity, built by the General Electric Co. This generator also provides direct current for the solenoid operated remote control valves on the Fuller-Kinyon transport system.

The crushed rock flowing from storage on the end of this belt conveyor is dropped past the magnetic head pulley into the hopper of an 18x36-in. Pennsylvania single roll crusher in which it is reduced to 1½-in. ring size, which size was considered the best for dryer feed. This crusher installation was a temporary one to take care of 4-in. material being received from the company's Nova Scotia quarry, where a new crushing plant to deliver 1½-in. material was in process of construction but as yet incomplete.

Conveying

From the single roll crusher the 1½-in. product is dropped on an inclined belt elevator of 62-ft. centers with 18-in. buckets on a 20-in. Goodyear "Longlife" rubber belt and is discharged to a 450-ton steel silo bin resting on a reinforced concrete foundation. Through the base of the silo the feed opens to an 18-in. inclined pan conveyor designed to act as a feeder for the whole plant. This pan conveyor is gear driven from a Reeves variable speed transmission, which in turn is chain driven from the motor furnishing the power. The pan conveyor discharges to an 18-in. Sandvik flat steel conveyor which runs horizontally at a sufficient elevation to allow the load to be scraped off at the feed opening of the present dryer. It is also laid out so that when the size of the plant is doubled the load on this belt can be doubled, permitting one-half of the load to be scraped off at the first dryer feed opening and the balance to pass on to the second dryer. It was felt that the steel belt would prove superior to a standard belt conveyor in that it would not require trippers and the divisions of the load in any desired proportions for dryer feed would be simplified by the use of scrapers. This steel belt is also arranged so that crushed gypsum rock may be loaded over the end without interfering with the feed to either the present or future dryer.



Interior of mill room showing the ring-roll mill and its motor and silent chain drive. The material transport system for calcined gypsum and its automatic control board shows at the extreme right

Drying

The dryer is a Ruggles Coles, type A-10, of special design in that the shell, bases and gear train are much heavier than usually installed in practice. The dryer furnace is also of special design to secure as perfect combustion as possible with high furnace temperatures and low fuel consumption. This furnace is equipped with a Huber hand-operated stoker for burning bituminous coal. This stoker and furnace combination has shown that on the average from 18 to 25 lb. of coal are required to dry a ton of crushed rock taken wet from uncovered outdoor storage. The capacity of the dryer as installed shows a considerable increase above manufacturer's rating. Cold air admitted after combustion is complete is used to regulate

the degree to which the rock is dried, and effectually prevents starting of the water of crystallization.

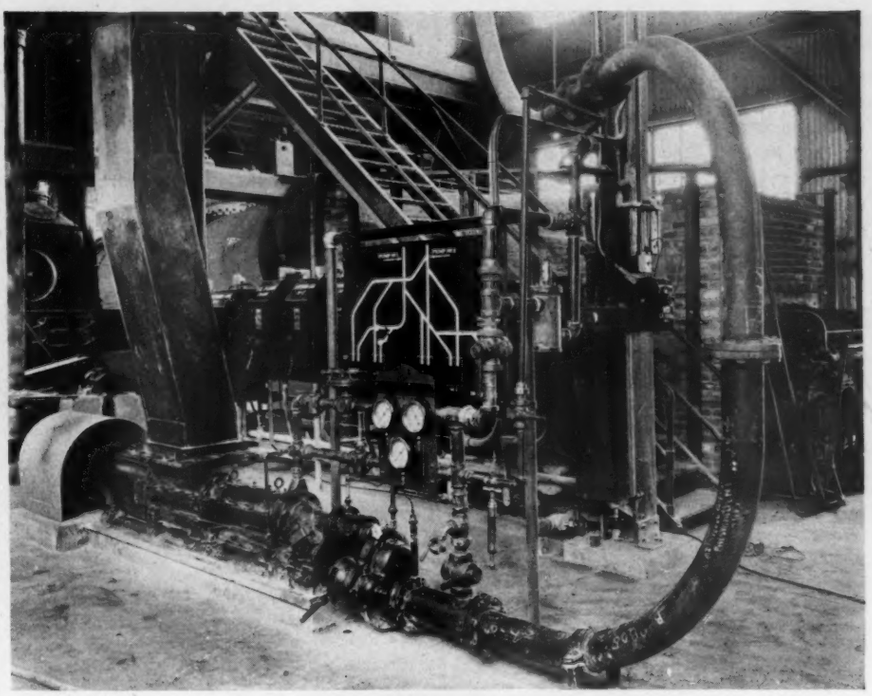
Draft from the dryer is created by means of a No. 60 Clarage steel plate fan whose suction removes the gases and vapors from the dryer hood, discharging them into a By-Products Recoveries, Inc., dust collector for dust removal.

From the dryer discharge hood the hot dry rock is dropped into the feed opening of a "Samson" type hammer mill, made by the Pennsylvania Crusher Co., direct connected to its motor drive. The material is here crushed so that all will pass a ⅜-in. ring and 45% will pass a 100-mesh standard testing screen forming a feed for the mills, sufficiently fine to increase the overall capacity of the mills themselves.

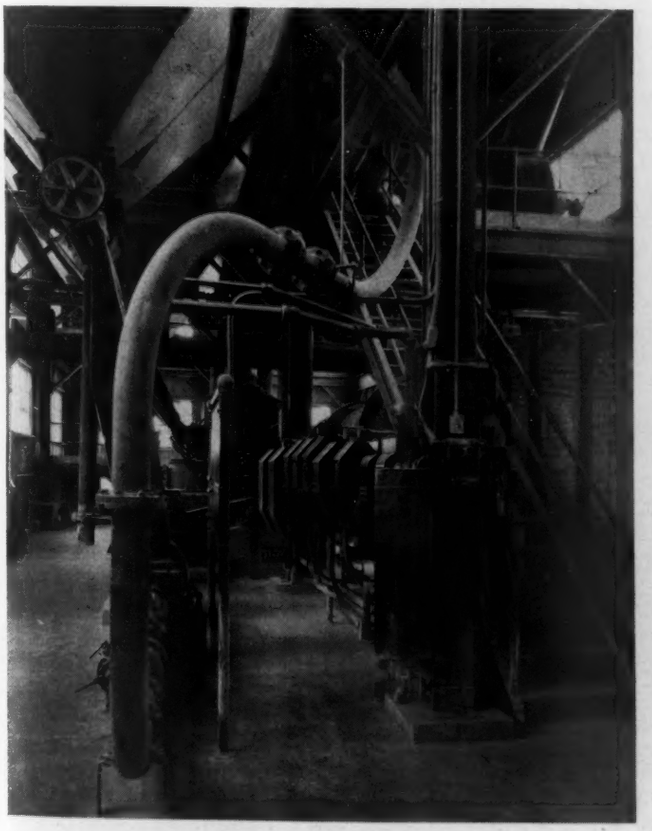
Grinding

The product from the hammer mill is conveyed and elevated to the crushed rock bins over the two Raymond mills. These bins are of steel, as are all bins throughout the plant, and have a capacity of 70 tons over each mill of the present installation and are so arranged that each one of the two bins will provide feed for one additional mill when capacity is increased.

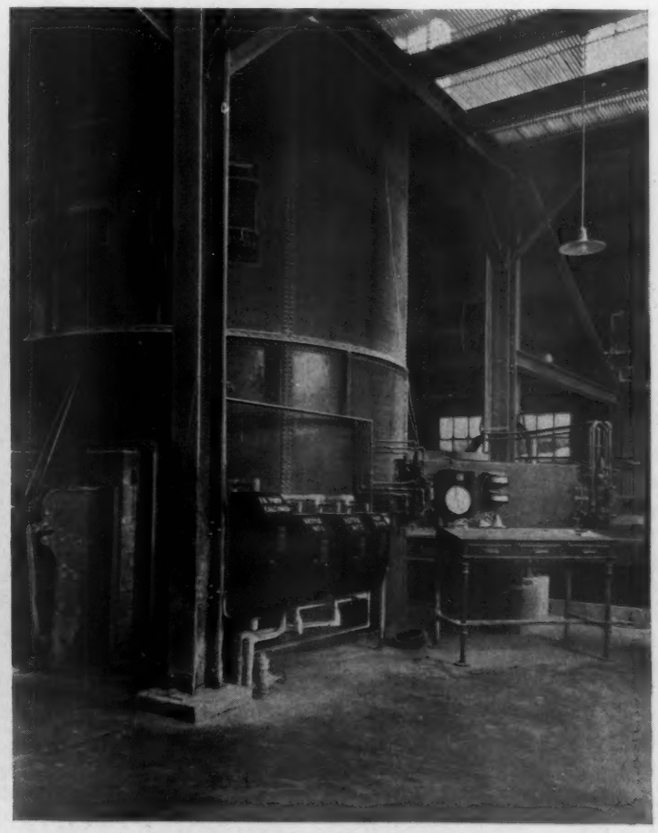
The Raymond mills are of the usual five-roller low side type with fans and separators used for grinding gypsum and allied products; they are connected to the motors driving them by silent chain drives furnished by the Ramsay Chain Co. of Albany, N. Y. This method of drive was chosen for the purpose of permitting experimentation in the interest of securing greater capacity at vary-



Special form of pneumatic dust dump for pumping raw ground gypsum to the kettles, and its electric control board



A section of the mill room showing the main controls for the pneumatic pump for land plaster. A part of the dryer furnace shows at the right



One of the two calcining kettles showing the stoker and motor controls. The valve board (right) has the instruments and air valves for controlling kettle feed, discharge gates and hot pit feeders

ing speeds of both Raymond mill and fan.

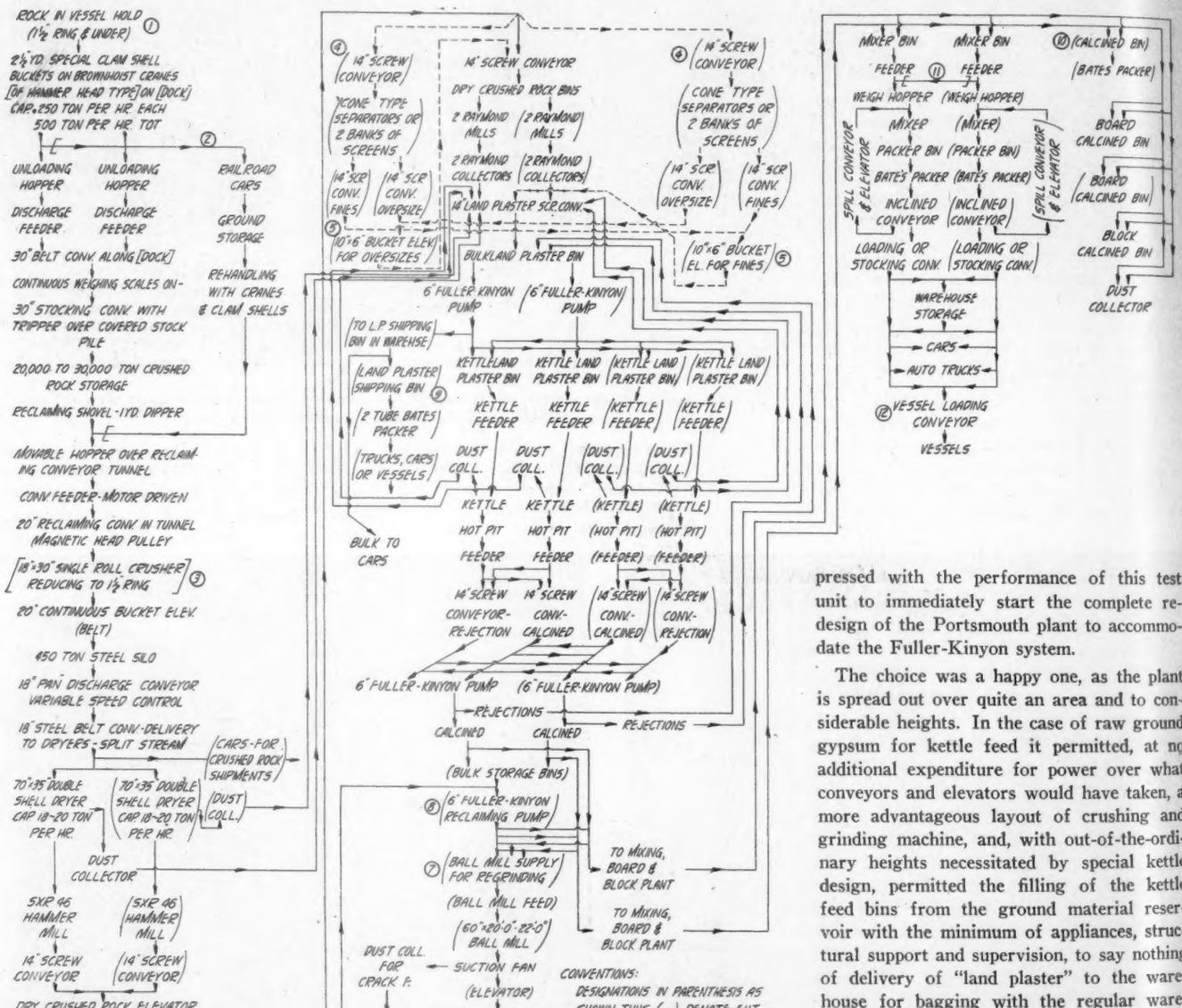
All dry crushed rock entering the bins over the mills is passed through a Richardson automatic scale, from the record of which an accurate log of plant capacity can be kept as an aid in compilations of costs and inventories. The output of Raymond mills is delivered to a large conveyor discharging into a ground gypsum or, what is termed, a land plaster bin. This same conveyor also receives the discharge from the dryer and kettle dust collectors as well as that from the general dust collector whose function it is to collect dust given off from the surplus air pipe of the Raymond separators, the hammer mill, and rock conveyors, elevators, bins, scales, etc.

This ground gypsum or land plaster bin, with a capacity of 70 tons of ground material, receives all fines and is the reservoir from which the feed bins directly over the kettles are supplied through a Fuller-Kinyon system of conveying.

Air-Conveying System

The Fuller-Kinyon pumps are fed from the land plaster bin by means of a special type of "Star" feeder, gear driven from an individual motor, which permits a non-flushing feed which can be regulated to the full capacity of the pump.

It may be well to add here that Fuller-Kinyon pumps, for the purpose of handling gypsum products, present a decided innovation in gypsum plant design. Originally this plant was designed for the usual complement of elevators and conveyors for handling both the raw ground gypsum and the calcined product. It was not until the Fuller-Kinyon system had been successfully demonstrated at a trial run on an installation made for the purpose of such trial at the company's New York plant, that a decision was reached to discard the plans already drawn and use the Fuller-Kinyon pumps for elevating and conveying. This test was made in August, 1926, and the writer was sufficiently impressed with the performance of this test unit to immediately start the complete redesign of the Portsmouth plant to accommodate the Fuller-Kinyon system.



Flow sheet of the Portsmouth, N. H., plant, Atlantic Gypsum Products Co.

The choice was a happy one, as the plant is spread out over quite an area and to considerable heights. In the case of raw ground gypsum for kettle feed it permitted, at no additional expenditure for power over what conveyors and elevators would have taken, a more advantageous layout of crushing and grinding machine, and, with out-of-the-ordinary heights necessitated by special kettle design, permitted the filling of the kettle feed bins from the ground material reservoir with the minimum of appliances, structural support and supervision, to say nothing of delivery of "land plaster" to the warehouse for bagging with the regular warehouse force and under the direction of the warehouse foreman, where such an operation rightfully belongs. Also the use of the Fuller-Kinyon system permitted the most logical location of both the board and block plants as well as the bulk calcined plaster storage and warehouse in buildings which already existed. To date, far less trouble has been experienced with this system of conveying than would, according to the writer's experience, have occurred had the usual system of elevators and conveyors been installed.

Material Delivery

The Fuller-Kinyon system delivers the

calcined gypsum by means of a 4-in. pipe line and automatic valves controlled by an automatic switchboard electrically controlled, into either of the two bins over the mixers in the warehouse, to the bins in the board plant and to the bins in the block plant. It also returns to the land plaster bins over the kettles, or to the main land plaster bin, any under-calcined product which may have been made when stoppage, for power failure or any other reason, has occurred.

As will be seen from a study of the flow sheet, there were a large number of points to which the calcined product was to be delivered or indicated for future delivery on the completion of the plant. While the distances do not show on the flow sheet, it will suffice to say that some points are as much as 800 ft. away. It will not be difficult for the engineer or the practical plant operator to visualize the multiplicity of elevators and conveyors which would have been required to accomplish the same result.

No claim is made that the installation is ideally laid out, but it may be conservatively said that, as the system is successful as installed, it will overcome almost any obstacle of conveying on such materials as it here handles. If any lack of judgment has been made it was the use of this system in hauling the raw ground gypsum or land plaster to the bins over the kettles, which might have been otherwise accomplished.

The results obtained, however, by this installation of the Fuller-Kinyon system have fully justified the redesign of the plant and the apparent hazard assumed in adopting something quite new in this industry.

The writer is again making use of this same method of conveying in the rebuilding of the same company's plant in New York City which was destroyed by fire in September, 1927.

To the average gypsum producer the most interesting part of this plant is undoubtedly the kettle installation for the calcining of the raw material. Of entirely special design, the result of much calculation and no little observation and experiment, it is as should be the case in all plants of a similar kind, the governing factor in plant output.

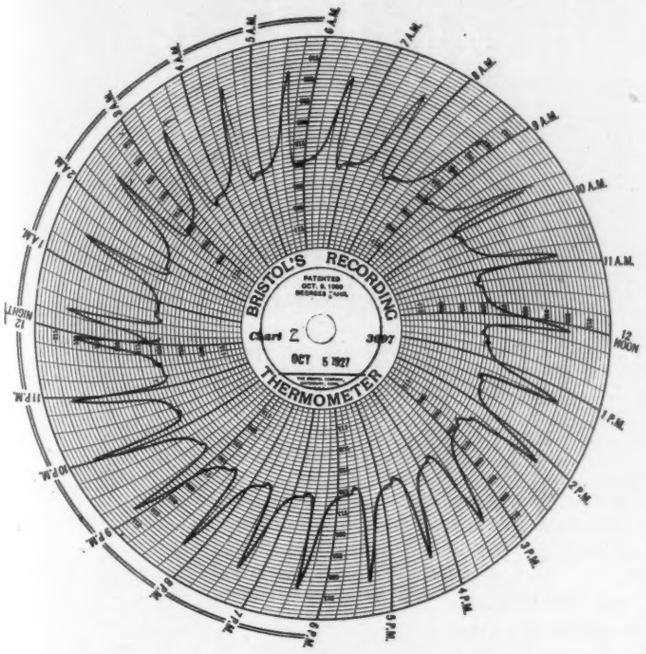


Chart from No. 2 kettle showing the temperature and cycle of operation in 24 hr. The filling time averages about 17 minutes; minimum total time is 50 minutes, and maximum 72 minutes. Total number of batches—24, with an average production of 11.3 tons per batch, or a total calcined gypsum production of 11.3 x 24 or 271.2 tons per 24 hours

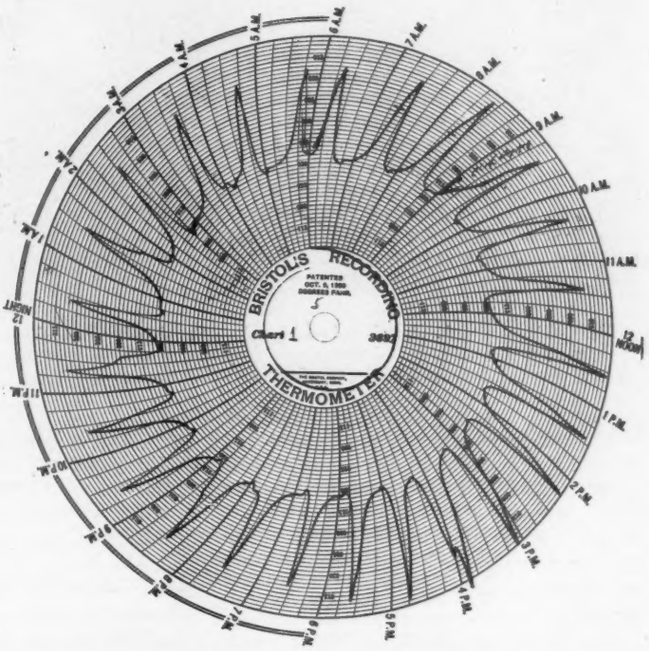


Chart from No. 1 kettle showing temperature and cycle of operation in 24 hr. The filling time averages 15 minutes; minimum total time is 45 minutes, and maximum 70 minutes. Total number of batches—25, with an average production of 11.3 tons per batch or a total calcined gypsum production of 11.3 x 25 or 282.5 tons per 24 hr.

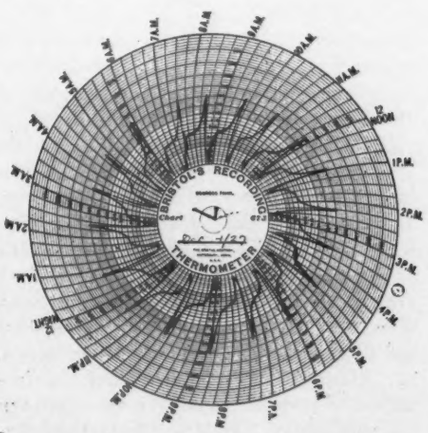


Chart from kettle of same type installed in another mill. Difference in temperature is due to different location of thermometer bulb. This particular kettle supplied by one mill which has difficulty in supplying sufficient raw material to keep up with kettle. Batches average 11.6 tons each due to slightly different bottom construction

Calcining

The kettles are fed from individual bins located well over the top of each, by means of feeders similar to the one feeding the raw material Fuller-Kinyon pumps. These feeders are driven by means of an air controlled friction clutch belted to the belt tightener shaft on the kettle drive. They are so speeded that they will handle the kettle feed at the rate of approximately 50 tons per hour in order that the charge can be completely filled in a period of approximately 15 minutes.

The accompanying charts taken from the Bristol recording thermometer attached to the kettles will show what they do in the way of performance, and from this it will readily be seen why it is necessary to fill rapidly to obtain the maximum time for actual calcining after the introduction of raw material. The chart indicates the batches made in 24 hours, average 11.3 tons per batch.

Kettle Control

The filling as well as the dumping of the kettles is entirely controlled by air cylinders on feeders and discharge gates. These cylinders are actuated through Westinghouse multiported air valves which give prompt

Feed bin over the kettle showing the star feeder and its drive. A section of the transport line from the raw gypsum pneumatic pump to the feed bin shows at the right

One of the mixers with its packer and take-away belt. The dust collectors in this part of the plant had not been installed at the time the picture was taken

and unfailing control of the cycle. There is no lag between the time the discharge gate is closed and the filling begins, and no danger of overheating the kettle. All valves, together with recording instruments, are located on a panel in full view of both calciner and fireman, and operation is governed thereby.

The kettles are fired by Huber hand-operated stokers which permit accurate control of fires, a prerequisite to proper calcining and low fuel consumption. Coal consumption here runs from 65 lb. per ton of output during continuous operation to 75 lb. per ton with intermittent, single or two-shift operation.

The output of the kettles is discharged into individual conical steel hot pits having a capacity of approximately 25 tons each. These pits have concrete tops and are vented to take care of the air displayed when the discharging of the kettle is going on. From the hot pits the calcined gypsum is fed, by means of single non-flushing screw feeders of special design, into either one of two oversized screw conveyors which in turn deliver to a small feed chamber over the Fuller-Kinyon pump which in turn distributes the calcined material to the balance of the plant.

Storage and Delivery

In the warehouse the calcined gypsum is received in steel bins located over the mixers. From these steel bins it is taken by screw feeders of non-flushing type controlled through special bearing and swing tighteners and delivered to the weigh hoppers over the mixers, where the required retarder and other ingredients are added for the manufacture of wall plaster. Each and every ingredient is weighed to insure uniformity of product.

Delivery to the truckers from the Bates packers is by belt conveyor and from there on the bagged material pursues the usual course into the cars.

In addition to the calcining plant, storage and warehouse, the Atlantic Gypsum Products Corp. has installed a board plant for the manufacture of gypsum wallboard, plasterboard and gypsum lath. The machine for manufacturing these products was built by the J. B. Ehrsam & Sons Mfg. Co. of Enterprise, Kan., while the dryer for board was built by the Coe Mfg. Co. of Painesville, Ohio. The company also installed a gypsum block machine designed by Caleb Paine and manufactured by the Gypsum Engineering and Manufacturing Co. of Chicago, Ill.

Barrows & Co. of Boston handled the general contract for foundations, concrete floors and miscellaneous construction; the the Palmer Steel Co. of Springfield, Mass., the structural steel and miscellaneous iron work; the New England Iron Works, the bins; the Ruggles-Coles Co., the dryer; the Pennsylvania Crusher Co., the single roll crusher and hammer mill, and the elevating and conveying machinery was built by the Sturtevant Mill Co. of Boston, the Link-Belt Co. of Philadelphia, Stephens-Adamson Mfg. Co. of Aurora, Ill., and the Sandvik Steel Co. of New York and the Fuller Co. of Catasauqua, Penn. The grinding machinery was furnished by the Raymond Bros. Impact Pulverizer Co. of Chicago; Turbine Equipment Co. furnished the speed reducers; the Panborn Co., the W. W. Sly Mfg. Co. and the By-Products Recoveries, the dust collectors. All motors are of General Electric Co. manufacture equipped with Allan-Bradley automatic resistance starters.

All special machinery, including kettles, was from special designs, and all design and construction was under the writer's supervision.

U. S. Survey Shows Idaho to Be Rich in Phosphate Rock

THE U. S. Geological Survey has recently published a 453-page report on "The Geography, Geology and Mineral Resources of Southeastern Idaho," by George Rogers Mansfield. The report embodies not only the studies of the author, but also summarizes other information obtained by government geologists in previous years, covering a territory of some 2200 square miles.

"The principal mineral resource of southeastern Idaho is phosphate rock," says Mr. Mansfield in summarizing a chapter on mineral resources. "This rock is characterized chiefly by its oolitic texture and generally dark color and by its odor when freshly broken, which resembles that of crude petroleum. It is a bedded deposit of marine origin and will have to be mined in the same manner as coal. The estimates thus far available for Idaho alone indicate a reserve of about 5,000,000,000 tons of high grade phosphate rock." The report describes in detail the geologic conditions found in each township and gives a mass of information valuable to anyone contemplating development of this latent resource. It also tells of small developments thus far made. In the last 20 years only 339,125 tons of phosphate rock have been mined in this region, so the deposits have been barely scratched. The average price per ton received during this period was $4.04, the peak price having been $5.79 in 1923.

The report also states that there is an abundance of limestone in the region but that it could not be profitably developed under the present sparsely settled condition of the country. The limestone would be suitable for the manufacture of cement if the market conditions were such that a plant could find an outlet for its product. There is also a quantity of sandstone.

Lime Burning Practice Based on European and American Observations

Part III.—Mixed-Feed Kilns—Advantages and Disadvantages

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

WHILE GAS-FIRED KILNS are used in Europe there are ten mixed-feed kilns to every gas kiln used. By mixed-feed kiln is meant a kiln in which rock and fuel are charged through the top in alternate layers. For fuel, coke is usually used, or coal of very low volatile matter content. Mixed kilns are being used in the United States but little, although there are some industries such as paper and glass manufacturing that seem to prefer them.

The main advantage in the use of mixed-feed kilns is that gas flow stratification so troublesome in gas and direct-fired kilns is, to a great extent, done away with; because the fuel is distributed evenly over the entire kiln cross-section. Then, the air enters through the cooler and is fully preheated while the lime is being cooled. Then the loss due to radiation is greatly reduced, especially if the kiln is effectively insulated. The firing is constant, not periodic as in direct-fired kilns. Due to all these, the efficiency of properly operated mixed-feed kilns is very high, and the high lime-fuel ratios heard of from European lime-kiln operation are ordinarily obtained with these kilns. A further advantage of these kilns is that firing is very simple, the kiln thus requiring less operating labor. The life of these kilns is much longer. Due to uniform burning over the entire kiln cross-section, automatic draws, if of the proper kind, become possible.

Alfred P. Searle, consulting technologist to the British rock products industries

Editor's Note

PART I of this series began in the January 21 issue with a discussion of varities of limestone and kiln types. Part II was published February 18 and discussed the faults and difficulties in lime kiln operation.—The Editor.

There are, however, also objections, ordinary coal of high volatile content can not be used satisfactorily; either coke or anthracite is required. The volatile matter is driven off in the upper portion of the kiln where there is little oxygen and so escapes unburned. A further objection is that fuel ash remains in the lime and so quality is effected. To cover this point, Alfred N. Searle, of Sheffield, England, was asked for a statement. Mr. Searle is one of the best known ceramic plant technicians in England. Following is his opinion:

The Quality of Lime from Mixed-Feed Kilns

By ALFRED B. SEARLE
Consultant to the Lime Industries

"In the mixed-feed type of kilns, the fuel and stone are placed (I) in alternate layers, the fuel ash being drawn with the lime at the bottom of the kiln; (II) in some kilns, part of the fuel is charged through the sides of the kiln, instead of being added at the top, the lime and fuel ash being drawn out together; (III) the Hoffman ring-kiln is another type of mixed-feed kiln in which part of the lime is mixed with some of the fuel-ash, but the greater part of the lime is free from ash. In the United States, mixed-feed kilns are little used because it is feared that the ash will be mixed with the lime reaching the customer. This is not the case as regards most of the lime.

"In a properly-managed continuous mixed-feed kiln, the lime as it is drawn, will be passed over a grid or grizzley to separate the small lime; the fuel ash, which should be powder and not clinker, will pass through the bars and so will be separated from the lump lime. As the small lime is sold as a much inferior product in England, the lump lime is practically as free from ash as that from gas-fired kilns. The lump lime may be slightly discolored in parts, as though it had been 'painted' with ash, but the percentage of ash in it is usually too small to show in an analysis.

Fuel Ratio for Mixed-Feed Kilns

"A good continuous mixed-feed kiln will not require more than 20 lb. of good fuel of 14,000 B.t.u. for 100 lb. of lime; and some of the best mixed-feed kilns will only require 17½ lb. of such fuel. If the fuel contains 10% of ash, only 2% of impurity would be added to the lime if all the ash were mixed with the lime; actually only ¼% of ash or even less is present in the lump lime. When it is remembered that a limestone containing 98% of calcium carbonate yields, under ideal conditions, a lime containing 96.5% of lime and 3.5% of impurities, it will be seen that, even if all the fuel-ash were to be retained in the lime, it would be only half the impurities normally present! As most limes naturally contain more impurity than this, the effect of fuel-ash on the composition of the lime is too small to be noticed!

"Consequently, apart from discoloration, the difference in the purity of lump lime burned in a mixed-feed kiln using good fuel and that burned in a gas-fired kiln or in a kiln with external fires is negligible. Indeed, the lime from a mixed-feed kiln is much more uniformly burned and there is a much smaller proportion of 'core' or imperfectly calcined stone.

"The discoloration of lime is often regarded too seriously; it seldom effects the color of the slaked lime and, as a matter of fact, the color of lime from a well-designed mixed-feed kiln is often better than that from kilns heated by gas or extended fires.

"The mixed-feed kiln must, of course,

be well-designed; the old, short pot-kilns will not give the results mentioned above, but they are regularly obtained in England, France, Belgium and Germany in kilns 32 ft. or more in height, from the drawing outlet to the point at which the gases leave the kiln.

"If a suitable mixed-feed and a good fuel are used, the quality of the lime obtained is, in every respect, as good as the ordinary 'run of kiln' product from a gas-fired kiln or a kiln with external fires, and if the small lime is separated by screening and attention paid solely to the lump lime, that from such a mixed-feed kiln will usually be superior to the corresponding product from other kinds of kilns."

Gerhardt Seeger's Opinions

Mixed kilns were discussed also to a considerable extent with Gerhardt Seeger, chief fuel technician of the German Lime Association. Mr. Seeger stated that gas kilns are not popular in Germany due to the greater repair costs as compared with mixed-feed kilns, also that of three rotary kilns built for lime burning only one remains in operation. That rotary kilns are not popular is readily understood if the high fuel costs in Germany, in proportion to labor costs, are considered. This objection also applies to gas kilns. The best gas kilns can't possibly be as efficient as the best mixed-feed kilns, but while Mr. Searle may be right that when fuel of low ash content is used the contamination will not be great and uniformity of burning greater, the lime from a mixed-feed kiln will not, cannot possibly, look as white and clean as some of the trade seems to demand over here.

Advantages of Mixed-Feed Kilns

Another advantage of mixed-feed kilns is that a very large amount of spalls can be burned, an amount that would seriously interfere with the satisfactory operation of a gas-fired kiln. In some cases where the kilns are equipped with fans for high pressure blowers, material of uniform size, much of it the size of spalls, is burned satisfactorily. This brings up the possibility of using these kilns for burning of small rock that now is wasted by many American lime producers. Mr. Searle was consulted in this matter and his statement was to the effect that stone in mixed-feed kilns should be fairly uniform in size. He thinks that if stone is cubic in shape and not flat, and is graded in the ranges of 6 to 4 in., or 4 to 2½ in., or 3 to 1½ in., the air blast or boxed draft would not be needed. But an air blast certainly is desirable on all mixed-feed kilns, even on those burning large stone. With kilns, that for many years were operated on natural draft, the capacity was almost doubled by a simple method of forcing air in at the bottom.

Fig. 6 shows a sketch giving the dimensions of a mixed-feed kiln considered by Mr. Seeger as correct. It will be noted that air is admitted mainly at the bottom, but some controllable amount of air also can be admitted on the sides. The air blast at the mushroom may be as high as 7 in., when an output of 45 tons of lime per day may be safely expected. This kiln is equipped with an observation gallery and peep holes. A man on top distributes the fuel and stone charges properly. The proper thickness of the layers will vary with the size of the stone, the size of the coke fuel and the air blast pressure available; with a good air blast the layers may be relatively thick. The kiln is drawn every three hours and naturally during that time the air blast pressure is reduced. For drawing two men are employed; the man on top comes down to help. The length of time required to draw would be one-half hour. While drawing the charge slips; there is no punching or cleaning of grates or eyes. The operation is very simple in this respect. While lime is drawn out of the kiln, it passes over bars spaced so that the small-sized lime falls into the first car and larger lumps into the second car.

Efficiency Obtained with Mixed Feed Kilns

Mr. Seeger stated that such a kiln should have a ratio of 5½:1 with coke of 12,000 B.t.u. per pound. Such a ratio means an efficiency of over 60%, which can be considered as very good when compared with the performance of other types of kilns. Mr. Searle stated that the best dependable ratio of an English mixed-feed kiln plant is 6.4:1, with anthracite coal of 3% volatile matter, and 14,000 B.t.u. This is almost exactly the same heat consumption per pound of lime as that given by Mr. Seeger.

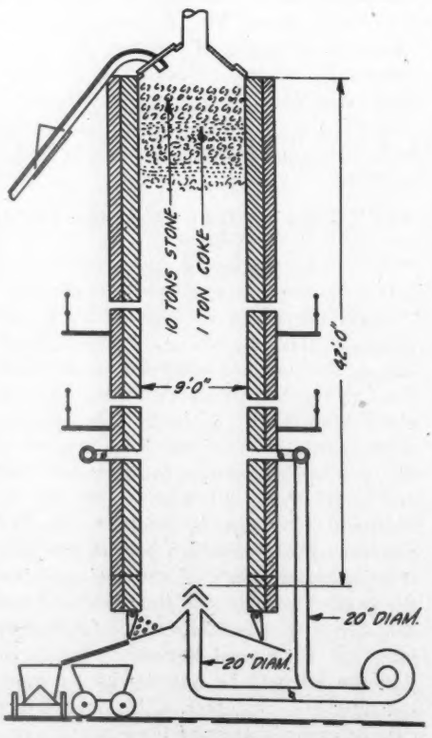


Fig. 6. Design of efficient mixed-feed kiln

Compared with the above ratios, gas kilns of the best type in Germany and England with good coal give only 5 lb. of lime per pound of coal. There is the further advantage that mixed-feed kilns are cheaper to build, so if only there were not for a tendency to lime discoloration, one would have something decidedly worthwhile. In Europe, however, apparently discoloration is not taken as seriously as over here. Really senselessly, we often want lime of chemical-purpose purity, where no such high degree of purity and appearance is really needed.

According to Mr. Seeger, the average gas analysis obtained from properly operated mixed-feed kilns in Germany ranges between 32 to 34% CO_2, about 3% oxygen and no carbon monoxide (CO). These analyses are better than any obtained by the writer in America. The fact that there is no carbon monoxide, that combustion is complete with this type of kiln, is most interesting.

But there are mixed-feed kilns that do not give as good results; and to obtain these good results, the coke-stone distribution must be right. If it is not right, there will be stratification, lop-sided burning, the same as that found responsible for the inefficiency of gas-fired or direct-fired kilns. This subject will be taken up again, when the design of specific plants will be discussed.

(To be continued.)

Effects of Impurities on the Causticity of Limes

A STUDY of the influences of the usual impurity components of caustic lime upon the accuracy of determinations of causticity values by a recently modified method is reported in *Industrial and Engineering Chemistry*. The factors of magnesia, alone and in silicate combination, interference of silica, neutral salt concentration of the titration system and the formation of ternary compounds were considered.

The authors of the study use the term "causticity" or "caustic value" in preference to "available lime" because in their opinion the uncombined CaO or $Ca(OH)_2$ content of a commercial lime should be the basis on which lime should be sold.

In the experiments, the impurities were introduced in varying proportions so as to simulate conditions found in different commercial limes. The data show a decided reduction in causticity resulted from the calcination of a lime-silica mixture, the greater the amount of silica the lower the caustic value. The effects of other impurities such as alumina, iron oxide, calcium sulphate, calcium silicate and magnesia were observed.

Some Problems of the Lime Industry —Their Solution

Coming Convention at New York in May—The Local Association Idea—How the German Lime Industry Is Organized

THE FOLLOWING OFFICIAL ANNOUNCEMENT is of vital interest to every lime manufacturer in the United States:

"The 1928 convention of the National Lime Association is to be held at the Belmont Hotel in New York City on May 23-24, as announced by the convention committee after careful consideration of many hotels and suggested dates. The most emphatic note in the announcement is that this is to be a *convention of the industry,* rather than of the association, thus recognizing the sound principle that the industry must be given a time and place to discuss the critical conditions which lost over three million dollars last year, with a decrease of over two hundred thousand tons in production.

Programless Convention

"To carry out this purpose there is to be no program for the convention, and no cut-and-dried plan to be offered for acceptance. Members and others are submitting questions bearing directly upon conditions which prevail in various sections of the country, and these questions will serve as the basis of a free-for-all round table discussion. It is hoped by all, members and non-members, that this discussion will form some constructive plans to put the industry upon a sound basis.

"In order to remove all suggestion of formality and predetermined conclusions, the chairmanship of the convention has been given to one chosen for his appreciation of present conditions and his freedom from any part in the controversies which prevail. This is at the request of J. F. Pollock, chairman of the board, and expresses the desire of the board for a strictly open meeting. The chairman will be S. W. Stauffer, of the J. E. Baker Co., at York, Penn. Everyone present will have an opportunity to talk, as long as his remarks bear upon the real problems of the industry.

"The Belmont has been selected from a field of many hotels which bid for the convention, because of its especially fine accommodations for a convention such as this one is to be. It is one of the older houses in the Bowman group, and is well located opposite Grand Central Station on 42nd Street.

"In order that there shall be no restraint whatever, and that the discussion may be strictly free, barring improper matters, the convention will not be reported for the publishing of proceedings.

"One, probably two, outstanding men will address the convention, and arrangements are under way with two men whose names will be sufficient urge for every lime manufacturer to attend.

"The convention committee is headed by S. W. Stauffer, assisted by A. B. Mack, assistant to the president, Kelley Island Lime and Transport Co., Cleveland, and G. B. Arthur, general manager of the National Lime Association, Washington, D. C."

Resume of the 1927 Convention

The following extracts from the address of the retiring president, Charles Warner, at the White Sulphur convention of the National Lime Association on May 17* last will bear repetition here:

"First: That the national dues, beginning with the new fiscal year July 1, 1927, be reduced to 1 c. per ton based on the total sales of lime products of the preceding calendar year, said dues to be paid in the same method as heretofore, namely, one-twelfth thereof monthly.

"Second: That the organization be reduced to a general manager and such few employees as the new income will support for the purpose of clerical work at headquarters, and as much technical service from the office as may be possible.

"Third: That the organization continue to utilize for the benefit of the members the large amount of information and literature accumulated over many years of research, and the experience gained in our past extended association work. Much good in these directions can still be done by continuing the distribution of publications on a cost basis, by having reprints made of popular pamphlets that are constantly being called for, by answering the constant stream of inquiries on technical and semi-technical lines which flows into the headquarters office, and in such other ways as a limited organization of this kind may still continue to help the industry.

"Fourth: The fostering and assisting in the formation of district or group sales promotion efforts, particularly on the part of the general manager of the association, in order to carry out so far as possible that specific phase of the proposed new association policy designed to push actual sales and promotion efforts in every possible community where the manufacturers locally interested can be persuaded to energize themselves in their specific markets."

At the time President Warner outlined the purpose and work of the reorganized national association the Ohio dolomitic finishing lime manufacturers had largely withdrawn from the national organization and formed the Finishing Lime Association of Ohio to co-operatively promote their product through research, publicity and joint sales effort.

Since, in the opinion of the rest of the lime industry, apparently, it was the action of the Ohio finishing lime manufacturers in withdrawing from the national association, that put the finishing touches to its debacle, it is only fair to allow those who promoted and now manage the Ohio association to express their views. What follows is such an explanation, or justification, in the words of the general manager and secretary, L. E. Johnson:

Aims and Purposes of Ohio Finishing Lime Association

"Trade associations are organized primarily for the purpose of increasing the utility of one's products and methods of salesmanship through education; secondly, for the purpose of self-protection; of surviving in an age of new competition; and, finally, bringing solidarity to an industry through the united efforts of such manufacturers as are interested in the same products.

"All industry has become highly complex; the markets are not only flooded with products of well-tried value, but also with many substitutes which are sold under the caption 'Just as Good,' against which the manufacturer of a quality product must seek to protect himself. Furthermore, there is a continual effort on the part of manufacturers to overlook the purpose for which their product can be sold and through special processes attempt to market their product for purposes for which it never was intended.

"The lime industry, which is one of the oldest in the country, has also become highly complex. It was not many years ago in the history of our country when merely to have a product for sale was sufficient. All com-

*See ROCK PRODUCTS, May 28, 1927, pp. 75, 76.

modities met needs and there were comparatively few competitive materials. This was due to the fact that the lime business at that time was highly localized. Lime rock is widely distributed, and a great many small plants which served the immediate needs of their vicinity were built. Lime was manufactured in one form, namely, lump lime; and due to the growth of the country there was no need for the expansion of their distributing or marketing systems.

"With the development of our country into an industrial nation, people began to concentrate in centers with a corresponding rapid growth of construction. It became necessary to increase the size of the plants to take care of this abnormal and rapid growth. It was not possible at this time to have an extended market for lump lime, due to the perishable nature of the product, and this condition existed up to the beginning of the present century, when the lime industry could be said to be a highly localized one, and it was customary for the manufacturers of lime to claim certain markets for their own.

Hydrated Lime Brought About Great Changes

"With the discovery and marketing of hydrated lime, the industry underwent a great change. Markets were no longer local and lime began to move long distances to new markets. This made the industry more complex, in that new competitors were met, and lime began to be sold on quality. At the beginning of the present century, the manufacturers in a small area in northwestern Ohio discovered that when their lime was hydrated that it had characteristics and properties not found in any other lime, and that their product was particularly adaptable for the purpose of plastering, and there began an ever-increasing demand for 'finishing hydrated lime' from all parts of the country. This was a national acknowledgment as to its superiority as a plastering material. Last year over half of the hydrated lime sold in this country came from the state of Ohio.

"With the development of the finishing hydrated lime industry came a consciousness on the part of manufacturers and users of lime that there is a difference in limes and that their classification is a broad one. No longer was it possible to consider all limes equal in value. This difference is so clearly defined that in the past the lime industry has suffered through loss of tonnage, due to the improper lime being used for purposes for which it never was intended. One of the reasons that competitive materials have replaced lime has not been due to their superiority, but rather to the fact that no information was available, nor any effort made to educate the user and the public as to the uses and limitations of the different limes on the market.

"With the knowledge of these conditions by the manufacturers of finishing hydrated lime and a consciousness that in the final analysis the successful marketing of any building is dependent upon the quality and the use to which it is put, they organized late in 1926 the Finishing Lime Association of Ohio, realizing that in this age of complexity in industry that competition does not mean industrial warfare, and that in order that the greatest benefit may be derived by the manufacturers individually, group effort is necessary. It is true that through group effort sacrifices must be made, but the returns from this effort more than offset the sacrifice.

Aims of the Association

"The forming of this trade association also represents an earnest desire on the part of the manufacturers to foster a spirit of progress, and shows a realization on their part that there are certain obligations that the manufacturers owe to the public which can only be met through group effort. A manufacturer has no right to believe that his product will be used for the purpose to which it is particularly adaptable, or that it will be used correctly. Therefore, it is his duty to see that the public and the user are properly informed as to the adaptability and limitations of his product.

"The manufacturer also has an obligation to the dealer in creating confidence in the mind of the user as to the quality of his product. It is for these reasons that the Finishing Lime Association of Ohio came into existence, and the aims, purposes and policy of the association is to maintain a uniform high standard of quality of finishing hydrated lime, and to educate builders to use and prefer it through the dissemination of information and personal contacts in the field.

"Before the advent of the Finishing Lime Association of Ohio, any educational work done in the lime industry was based on the assumption that all limes were equal; that regardless of the chemical analysis and the physical form, the results would be identical. Therefore, it is the aim and purpose of the Finishing Lime Association to disseminate information as to the properties and characteristics of finishing hydrated lime only, and the purpose for which it is adaptable.

"Another function of the association is to improve manufacturing processes, investigate new uses and, in general, improve the standard of their product. In order that duplication of effort be avoided, this activity should be carried on through group effort.

"The association also acts as a clearing house for information pertinent to the finishing lime industry.

"The association is a member of the Producers' Council, the American Society for Testing Materials, the American Concrete Institute and the Building Officials Conference, and is thus able to present its views and keep in touch generally with the new developments in the construction industry.

"As has been stated before, there has been a great deal of information obtained and work of a promotional nature done within the lime industry as a whole, but it has not been classified or specific.

"Further, while it is interesting to know that lime has been used in construction for thousands of years, it is not pertinent to the construction problems of this age of new competition and efficiency. The problem that confronts the industry today is one of classification and adaptability. The finishing lime manufacturers through their association are expressing their belief in the above premise, and the association through its district engineers has learned that there is a desire in the construction industry for classified information on limes; and, further, that there is urgent need for promotional work of this nature.

"The general offices of the association are located in Toleo, Ohio, and district offices are maintained in New York, Philadelphia, Atlanta, Pittsburgh, Cincinnati, Detroit, Chicago and St. Louis with district engineers in charge, who are experienced construction men and are qualified to render services to the construction industry relative to the manufacture, preparation and application of finishing hydrated lime."

The Quality Products Institute

So far as we know but one really local group has organized along the lines laid down by the 1927 convention of the National Lime Association at White Sulphur Springs. This is a group chiefly interested in the eastern Pennsylvania, New Jersey, Delaware and Maryland district. Representatives of G. and W. H. Corson, the North American Cement Corp. (owner of the lime plant of the former Security Cement and Lime Co.), the Pennsylvania Lime Products Co., the Steacy and Wilton Co., the Van Sciver Corp., and the Charles Warner Co. got together and on December 8, 1927, launched the Quality Products Institute with headquarters in Philadelphia. Franklin S. Lee is general manager, and Tyrrell B. Shertzer, who was a field engineer of the National Lime Association for several years, and more recently manager and engineer of the Ohio Dolomite Association, is engineer of the new Institute.

This association has already done four things that the National Lime Association never got to: (1) Adopted an emblem or trademark to be used on the packages of all the products of all the members; (2) recognized the necessity of a standard of quality for membership—in this case the A. S. T. M. specifications for hydrated lime and portland cement (as a constituent of "Trowlite"); (3) engaged in a joint advertising campaign —so far only in the agricultural papers; (4) recognized the necessity or desirability of making and promoting a lime product in which other materials than lime constitute a considerable part.

The last accomplishment is perhaps the

most significant, bearing in mind the attitude of lime manufacturers generally that the advocacy of any admixture to lime for any purpose whatsoever is rank heresy. Specifically, the Quality Products Institute includes in its membership the manufacturers of "Trowlite" cement—a mixture of portland cement and hydrated lime, in which lime is the lesser constituent. These two manufacturers are the H.-V. Corp. (the Hercules Cement Corp. and the Van Sciver Corp.) and the Fuller-Warner Co. (the Allentown Portland Cement Co. and the Charles Warner Co.). "Trowlite," as its name implies, is designed for mortar uses in competition with natural cements and hydraulic limes sold under various trade names. The name "Trowlite" is copyrighted, the copyright being owned by the H.-V. Corp., which it is understood will license other lime manufacturers to use the name for a portland cement-hydrated lime mixtures without cost, but under certain restrictions as to quality, participation in promotion work, etc.

Objects of the Institute

The first public announcement of the Quality Products Institute, an advertisement in the January issue of the *Pennsylvania Farmer*, reproduced herewith, gives the objects of the institute as follows:

"The institute makes available to consumers of lime and 'Trowlite cement' a dependable source of information regarding the qualities, uses and economic values of lime in agriculture and of lime and 'Trowlite cement' in construction.

"High standards of quality are established or adopted by the institute for certain of these materials and the member companies pledge themselves to maintain these standards.

"The seal of the institute will be placed by members on bags containing these standardized materials as an assurance of high quality.

"The institute will welcome the participation of other manufacturers, who fully subscribe to its principles.

"Consumers are cordially invited to submit to the institute any problems concerning the materials covered by this organization and are assured of a sincere effort to make serviceable response."

All of the institute advertising to date and a large share of its field work have been directed toward the sale chiefly of agricultural lime and hydrated lime to the farmer. John A. Slipher, formerly chief of the agricultural department of the National Lime Association and now of Ohio State University, is consulting agronomist for the institute; and under his general supervision two field men, R. H. Engle and Kenneth Hankinson, are employed. Mr. Engle was extensive service agent in Erie county, Pennsylvania, for the State College and Experiment Station. Mr. Hankinson is a former student at the New Jersey State College at New Brunswick, and comes to the institute with the recommendation of Dr. Jacob G. Lipman, dean and director, a famous authority on agricultural lime. All of the advertising carries the seal of the institute. The activities and methods of the institute have already led to inquiries regarding membership from other lime manufacturers—something the National Lime Association, if we recollect, was seldom bothered with!

Most of the research work of the institute thus far has been to determine the most satisfactory mixture for "Trowlite." No research work nor field work has been done in connection with industrial or chemical uses

January 25, 1925 *Pennsylvania Farmer* 8—77

The
QUALITY PRODUCTS
INSTITUTE
has been
formed
by

a group of Lime and Trowlite Cement manufacturers for the purpose of rendering a wide-spread service.

The Institute makes available to consumers of Lime and Trowlite Cement a dependable source of information regarding the qualities, uses and economic values of Lime in agriculture and of Lime and Trowlite Cement in construction.

High standards of quality are established or adopted by the Institute for certain of these materials and the member Companies pledge themselves to maintain these standards.

The Seal of the Institute will be placed by members on bags containing these standardized materials as an assurance of high quality.

The Institute will welcome the participation of other manufacturers, who fully subscribe to its principles.

Consumers are cordially invited to submit to the Institute any problems concerning the materials covered by this organization and are assured of a sincere effort to make serviceable response.

* * *

Hydrated Lime for use in agriculture is one of the materials governed by the Institute standards. All such Lime produced by member Companies must meet or exceed U. S. Master Specification No. 249 as published by the Bureau of Standards, Washington, D. C.

The Seal of High Quality is shown above as it will appear on the bags of Hydrated Lime produced by Institute members.

QUALITY PRODUCTS INSTITUTE

The Seal of High Quality

MEMBERS *of* QUALITY PRODUCTS INSTITUTE

G. & W. H. CORSON
NORTH AMERICAN CEMENT CORPORATION
PENNSYLVANIA LIME PRODUCTS COMPANY
STEACY AND WILTON COMPANY
THE VAN SCIVER CORPORATION
CHARLES WARNER COMPANY

H.-V. CORPORATION
HERCULES CEMENT CORPORATION
THE VAN SCIVER CORPORATION

FULLER-WARNER COMPANY
ALLENTOWN PORTLAND CEMENT COMPANY
CHARLES WARNER COMPANY

February 25, 1928 *Pennsylvania Farmer* 11—873

If Clover Balks— USE LIME

WHEN clover balks something must be done. For clover is the barometer of farm prosperity. If clover is good—cash crops also are good and the livestock enterprise can be profitable. Without good clover, farming is an up-hill struggle.

There is a cause for clover balking; it is mainly a lack of soil lime.

Farm products remove lime. A ton of clover takes away 60 to 100 pounds of lime (in terms of hydrated lime). One cow puts into her milk as much lime as contained in 300 bu. of corn. An average steer walks off the farm with 75 pounds of lime in his bones and body tissue.

Cropping uses up lime. Long cropping may and does bring the stock of lime in much of our land to a low ebb. That is especially the case on those soils that were not rich in lime to begin with.

And clover is slipping! Our national clover patch has shrunk a full 40 per cent in the last twenty years. Lime is the tool to bring back clover.

Clover wants a soil well loaded with lime. It needs that lime partly for food purposes. As much as 125 pounds of lime hydrate are taken up into the clover plants, in an acre's growth. Lime-lean soils fail to deliver up that quota—and clover suffers.

Then, too, lime favors the establishment of the infectious nodule bacteria on the roots of the legume. The lime destroys soil acids which are the barrier to free nodule growth and bacterial activity. By the agency of the bacteria the crop can draw two-thirds of its nitrogen from the atmosphere. In this capacity lime insures having a miniature but successful Muscle Shoals nitrogen laboratory in the basement of every field.

If we are anxious for a 100 per cent clover-soil, then we are interested in liming. By keeping a safe balance of lime in the soil, clover is brought to more acres, yields bountifully, and the old bug-a-boo of "winter-killing" largely fades away.

QUALITY PRODUCTS INSTITUTE

A source of information regarding the economic values of Lime in Agriculture

TELEPHONE: PENNYPACKER 3337 1032 GUARANTEE TRUST BUILDING PHILADELPHIA, PENNA.

MEMBERS

G. & W. H. CORSON
NORTH AMERICAN CEMENT CORPORATION
PENNSYLVANIA LIME PRODUCTS COMPANY
STEACY AND WILTON COMPANY
THE VAN SCIVER CORPORATION
CHARLES WARNER COMPANY

Look for the Seal of High Quality on bags of Hydrated Lime produced by our members.

MEMBERS

H.-V. CORPORATION
(HERCULES CEMENT CORPORATION)
(THE VAN SCIVER CORPORATION)

FULLER-WARNER COMPANY
(ALLENTOWN PORTLAND CEMENT CO.)
(CHARLES WARNER COMPANY)

Two examples of the "prestige" advertising adopted by the newly organized Quality Products Institute

of lime, and none is, apparently, contemplated in the near future.

The cost of membership in the institute, while not on a strictly tonnage basis, we understand, averages approximately 11 or 12 c. per ton of production, which is twice as much as the National Lime Association was ever able to collect for membership dues. Membership in the institute is said to be limited to members of the present National Lime Association and the Portland Cement Association.

Conclusions About the Institute

Apparently the Quality Products Institute is proceeding along sound lines in featuring a trademark and requiring a quality standard for membership. Apparently its exponents are right in assuming that certain types of promotion and field work can best be handled by local groups of producers whose market interests have much in common, for certainly a national campaign to promote such a product as "Trowlite" would be practically impossible of accomplishment. It is earnestly urged that the work of the institute is in no way hostile or competitive to the National Lime Association. Apparently effective promotion work for industrial and chemical lime is recognized as almost entirely a national association function. It would seem that there is at least a possibility of local associations and the national association working together in harmony, when the sphere of each is known and observed.

In Germany the lime industry is organized into two distinct associations which cooperate for the good of the entire industry. The following description of these two organizations and the sphere or scope of each should prove helpful:

Organization of the German Lime Industry

The first union of the German lime industry dates back to February 25, 1892, at which time the lime section was organized inside the "German Association for the Manufacture of Brick, Clay Products, Lime and Cement." This section represented a close union of the industry, and in 1898 became the "Association of Lime Interests," remaining a part of the above organization. It was only in 1908 that the lime industry became entirely segregated from the main organization and its representative organ assumed the name of "Association of German Lime Manufacturers." (General Convention, February 24-25, 1908.)

The latter organization dealt with all the problems pertaining to the industry in general.

The economic conditions caused by the war brought about in 1918 the formation of an economic and political professional union, joined by a great number of the lime manufacturers, which received the name "German Lime-Union" (Deutscher Kalk-Bund) and undertook among other things to supervise the apportioning of coal, resulting in a final consolidation of all German lime manufacturers.

As it is impossible to separate the economic and political problems from certain technical problems and vice versa, as illustrated by the building industry, it soon appeared desirable to merge the two organizations. This was accomplished a few years after the formation of the Lime-Union by joining the personnel of the two offices. Further growth of these organizations resulted in the inauguration of a "Heat Committee" of the lime industry, which keeps in close touch with the main body, as well as of the Information Bureau, closely related to the Lime-Union. The Kalkverlag G.m.b.H. (Lime Publishing Co., Ltd.) was founded in 1925 and took over the publication of books, bulletins and pamphlets, which heretofore was handled separately by each organization. All five offices are located in one building, Berlin W 62, Kielganstrasse 2.

The common location of business offices and joint personnel, as well as general cooperation, permit maximum exploitation of available facilities and of material furnished by the various departments.

The business offices are the executive organs of the different organizations, whose functions are defined as follows:

The Association of German Lime Manufacturers, which claims to have been founded in 1892—the year when the Lime Section was organized—has for its officers a president and two vice-presidents; one of the latter is the business manager of the business office of the association. The more important affairs are reported upon at the general convention, open to all members. The membership is restricted to German lime companies and their sales organizations. Firms and associations related to the lime industry (manufacturers of kilns, machinery, especially crushing and pulverizing machinery, consumers' unions, etc.) may become special members. The association has an honorary president and a number of honorary members, who are either lime manufacturers or persons engaged in research work, whose achievements in the lime industry are conspicuous.

The "Business Committee" deals with all general association affairs, particularly the financial affairs. Aside from the officers, it numbers 22 members.

A number of technical committees deal with the professional, scientific and technical problems, recommend tests and submit reports on test results. These committees are as follows:

Research committee on agricultural lime,
Committee on structural lime,
Committee on industrial lime,
Quarry committee,
Kiln committee,
Committee on grinding and slaking

and a few others.

Aside from the meetings of the committees and the closed convention meetings, to which only members are admitted, open meetings are held, generally in connection with the conventions. Whenever occasion arises, so-called "Heat Sessions" of the lime industry, "Industrial Lime Sessions" and "Building Lime Sessions" are held, at which reports are submitted by representatives of the office or of the industry, more frequently by men engaged in research or in practical work, on lime plants (kilns, quarries, etc.) or on the uses of lime (agricultural, structural, chemical industry). At such times special stress is laid on the presentation of new viewpoints and the latest researches.

A brief pamphlet appearing at the close of the year summarizes the activities throughout the year. Aside from this, two or three volumes of "Reports of the Association of German Lime Manufacturers" appear in the course of the year, containing, besides the summary of activities, the proceedings of the conventions, reports submitted at these, as well as certain special reports on the lime industry.

A series of publications is released each year, aiming to spread a knowledge of lime, and dealing with the uses of this product with special reference to the agricultural uses of lime. These publications are partly scientific, partly of a popular character. Price quotations are not published, but cost-keeping sheets are prepared for distribution among the member companies practically at cost, with but a slight overhead charge.

Special stress has been laid in recent years on the remodeling and improvement of existing lime plants. A great share of the activity of the association is devoted to this. The "Heat Committee" of the lime indusry was founded for this purpose and is making investigations of kilns now in operation. Its success may be judged from such savings of fuel as 25-30% (8-10% of burned lime), which are not infrequent. This committee also approves new installations.

The German Lime-Union is not a corporation like the Association of German Lime Manufacturers, but is a limited partnership (Gesellschaft mit beschrankter Haftung). It co-operates closely with its members and the supervising board composed of 42 member companies. It also maintains committees as follows:

Social-political committee,
Socialization committee,
Taxation committee,
Tariff and transportation committee,
Industrial statistics committee,
Duty committee, etc.

The board and committees are being constantly informed on their respective subjects by means of circulars.

As the ecnomic and political organization of the German lime industry, the German Lime-Union faces the following tasks: Keeping a constant check on events of commercial and political nature affecting the lime industry; this applies particularly to the making or alteration of commercial treaties.

In such cases the German Lime-Union cooperates with state institutions, its statistical material being of great value in this connection, as well as in every other branch of its work. The German Lime-Union furnishes sales data and other material of the lime industry to the State Department of Statistics and the Institut fur Konjunkturforschung.

An important part of the work is cooperation with the German State Railways and their offices located in different parts of Germany, as well as with private roads, in order to secure favorable freight rates for lime products. Claims of shortage of dump cars used for transportation of lime are taken up with the State Railways through the medium of the German Lime-Union, which keeps a check on the movement of these cars.

Taxation, valuation and transfers of limestone quarries, as well as taxation of certain lime-burning devices, are the problems handled by the Taxation Committee of the Union. In an effort to reduce the severe taxes imposed on the lime industry, this organization enters into negotiations with the individual governments throughout Germany, their State Departments and Treasuries.

As the German Lime-Union is not an employers' organization, its social, political and legal functions are restricted to reports on the latest events by the Social-Political Committee. These include wages in the lime and related industries, contracts, working hours, strike conditions, etc. Member companies are advised on their labor problems by experts. The closing of tariff agreements is outside of the scope of its activity, being regulated by employers' unions, whose members include some of the members of the German Lime-Union.

As in the case of the Association of German Lime Manufacturers, the business office of the German Lime-Union arranges the meetings of the different committees and of the board, and plans the conventions, at which professional reports are submitted and discussions are entered into not only by members but by outstanding business men and scientific authorities. The activities of the Union are summarized in the annual "Proceedings," which testify to the extensive work carried on by this organization.

The business offices of the two organizations represent a collecting and digesting center for all problems concerning the lime industry. Aside from personal correspondence with individual members, circulars are sent out to committees; events of interest to the lime industry in general are published in the forms of *Lime News*, a publication available to members only and appearing at no definite intervals, but generally at least once a month. The Information Bureau of the Lime Industry forms a link between the two main organizations of the lime industry and the press. The Bureau sends out all reports on the conditions of the lime industry, destined for publication, and watches their appearance in the press.

A collection of documents and information, used as material for the publications of the Information Bureau, should be mentioned. The Association of German Lime Manufacturers has a separate collection of material for reports and lectures, exhibits and other purposes. A collection of slides permits easy planning of lectures. A large number of charts relating to various phases of lime production and uses is available for exhibits. A collection of lime samples, limestone, minerals, lime colors, etc., recently begun, serves the same purpose.

The Future of the American Lime Industry

What happens to the lime industry in the United States in the next few years rests largely with what action is taken at New York in May. The industry has "slipped" appreciably in the last year. There is still an opportunity to recover lost ground. There are tremendous potential markets in construction, in industry, in agriculture; but those markets must be sought out and developed by modern scientific methods. There is a vast amount of technical information in regard to efficient manufacturing methods and processes to be sought for and applied. Who is going to do it and when?

Builders' and Gravel Company Organized in Seattle

ANNOUNCEMENT was recently made by Ray T. Wood, Seattle contractor and former city engineer, that he had filed articles of incorporation for the Builders' and Gravel Co. of Seattle, to operate in that city. The capitalization of the new company was given as $50,000. The firm has bought the property and business of the Superior Sand and Gravel Co. of Seattle, and has taken over Mr. Wood's central concrete mixing plant, and will conduct a sand, gravel and ready-mixed concrete business. Mr. Wood is a pioneer in the ready-mixed cement business in the Northwest, having established the ready-mixed plant in Seattle last May, and having operated a similar plant in Olympia, Wash., for some time. The new company is an outgrowth of these two plants. Operations are to start at once, according to Mr. Wood, with the first contract for material for the Northern Life building in Seattle, a 27-story structure.—*Olympia* (Wash.) *Olympian.*

New Cast Stone Plant for Greensboro, N. C.

THE Arnold Stone Co., Inc., of Jacksonville, Fla., is erecting a plant for the manufacture of architectural cast stone on a two-acre tract in Greensboro, N. C., and expects to have it ready by April 1. The new plant will have a large building, 50x100 ft., with a smaller office building, and will represent an investment of $25,000. This is the first unit of the plant, and later it will be expanded to accommodate increased demand. L. Krippner has been transferred from the original plant of the company at Jacksonville to be manager of the Greensboro plant. M. A. Arnold, of Jacksonville, is the president of the company.—*Greensboro* (N. C.) *News.*

Ottawa Silica Company Buys U. S. Silica Company

THE Ottawa Silica Sand Co. of Ottawa, Ill., one of the largest silica producers in the Illinois district, has recently announced the purchase of all of the property of United States Silica Co., at Ottawa. The property acquired includes a modern washing and drying plant, which was only recently completed, and 65 acres of silica sand land. The sale of the U. S. company, of which Volney Foster, of Chicago was president, eliminates the Foster family from the silica sand business after continuous association in the industry for nearly forty years.—*LaSalle* (Ill.) *Tribune.*

Nazareth Portland May Increase Capital Stock

THE Nazareth Portland Cement Co. of Nazareth, Penn., has proposed an increase in its capital stock from 157,000 shares of stock having no par value to 210,000 shares, of which 200,000 shares would be common stock with no par value, and the other 10,000 shares would be 7% cumulative convertible preferred stock with a par value of $100. A special meeting has been called for April 9 when the stockholders will vote on changes.

Swelling of Bentonites and Its Control

A STUDY by C. W. Davis on the effects of different liquids on the swelling of bentonites is reported in a recent issue of *Industrial and Engineering Chemistry*. The author found that lubricating oil, kerosene and gasoline prevent swelling and leave a hard, granular residue. Dilute solutions of various salt solutions retard swelling but saturated salt solutions are required to obtain the maximum effect, with a resultant firm residue, for each type of bentonite. For some bentonites sodium chloride gives satisfactory results.

Change of temperature from 1 deg. C. to 94 deg. C. accelerates the rate of swelling but has little effect on the final volume of solutions used. Increase of acidity or alkalinity depresses the swelling of bentonite. Equivalent quantities of neutral salts reduce the swelling of bentonite to about the same degree but the salts with univalent anions (NaCl, KCl, etc.) are slightly more effective than those with polyvalent ions ($BaCl_2$, $AlCl_3$, etc.).

Railway Engineers Discuss Ballast

AT the American Railway Engineering Association convention at the Palmer House, Chicago, on March 6, the committee on ballast presented a report covering the subjects shown in the following appendices:

Appendix A—Revision of Manual

Collaborating with Committee XII (Rules and Organization), it was found that the matter on pages 83 to 86 inclusive of the Manual, under the caption "Instructions to Govern Ballasting on an Operated Line," should be properly included in the rules to govern conduct of work. It was agreed that the committee on rules and organization will submit to the association for approval rules to govern the conduct of ballasting operations, and it was recommended, therefore, that the matter appearing on pages 83 to 86, inclusive, be eliminated from the Manual upon the adoption by the association of rules covering this subject presented by Committee XII.

Appendix B—Review of the Material on Ballast in Association Literature; Practices of the Railways

The committee sent out a questionnaire and 47 replies thereto have been received. The following tables are a digest of the replies made by the several railroads:

SECTIONS

Type of ballast	No. of roads using A.R.E.A. Standard	A.R.E.A. Modified	Their own section	No answer to question	Type not used
Gravel	8	8	26	1	4
Stone	6	6	25	3	7
Other	4	2	25	4	12

SPECIFICATIONS

Type of ballast	No. of roads using A.R.E.A. Standard	A.R.E.A. Modified	Their own section	No answer to question	Type not used
Gravel	9	6	23	4	4
Stone	11	6	20	3	7
Other	4	2	25	12	4

TESTS

No. roads using recommended tests	11
No. roads using some of the recommended tests	3
No. roads not using recommended tests	27
No. roads making no answer	6

Although few railroads indicated that they had adopted either the recommended sections or specifications, the thought was expressed by nearly all that the association's sections and specifications furnished data on which to base the sections or specifications used by the individual road. The committee, therefore, recommended that no changes in the sections or specifications be made at this time.

Appendix C—Comparative Values of Various Ballast Materials

This subject was studied in collaboration with representatives of Committee I (Roadway) and a questionnaire was sent out to 43 roads in the United States. Answers were received from 21 of these roads. In making a study of the figures received, and of conditions on different roads, considerable variation is found, due to different physical characteristics and density of traffic. The economical use of the various kinds of ballast is dependent almost entirely on these factors.

Where traffic is heavy and subgrade conditions are such that frequent surfacing is not necessary, stone ballast is more economical to use. However, where subgrade conditions are not good and a frequent movement occurs, caused by physical conditions, making necessary frequent working of the track, gravel ballast, which can be worked approximately 50% cheaper and quicker, is much more economical.

There is some diversity of opinion as to the economical advantage obtained in the use of stone ballast on heavy coal-carrying roads, due to the rapid filling up of voids by small particles of coal and coal dust. This, of course, will occur within a certain distance of the mines, say 150 miles. This necessitates much more frequent cleaning and the resulting loss of ballast.

Appendix D—Pumping Joints and the Cost of Maintenance

The general causes of pumping joints can be listed almost entirely under the five following heads: (1) Water impounding in roadbed; (2) Foul ballast; (3) Creeping rail; (4) Light rail under heavy traffic, and (5) Improper or insufficient tamping. The remedies for these conditions in most cases have to be handled individually. However, there are certain general remedies that can be applied. In the second cause mentioned above where the ballast has become fouled, the water will not drain and pumping joints will invariably be the result, in which case it is necessary to clean out all of the foul ballast, and either clean or replace with new, and give the track a substantial raise on the clean ballast. Local conditions will have to determine as to whether the expense of cleaning the ballast is justified. In most cases where the ballast is sufficiently fouled to cause a large number of pumping joints, the expense of cleaning will be justified, as we have developed that it costs two and one-half to four times as much to maintain track where the joints are pumping badly as where the track is well drained and no signs of pumping occur.

Appendix E—Shrinkage of Ballast

Ballast, other than pit run gravel, cannot be measured in place at the point of origin, so the usual practice is to measure the loosely loaded ballast on cars or by weighing. The majority of railroads in handling their ballast, while they may buy it by weight, usually convert it into cubic yards and report it as used and paid for on that basis. It is the belief of many that there is no actual shrinkage or loss of ballast between the point of origin and destination if loaded in proper equipment, admitting, however, that there is a loss in the volume, due to the settlement of the ballast in the cars.

Two tests, one with gravel ballast and one with broken stone, have come to our attention, and in the case of the washed river gravel it was found that after transporting same 152 miles there was a loss of 13.79% in volume; and in the case of the crushed limestone, while there was a loss in the four cars tested of only 190 lb., there was a loss in volume of 13%. These two tests show that there is a volumetric shrinkage due to hauling the ballast, and bring out the fact that considerable care should be exercised as to the determination of the average weight of the cubic yard of ballast which is to be later applied to the aggregate weight of ballast used or purchased. No injustice will be done either the railroad or the contractor if it is definitely settled where and when measurements are to be taken, for the price will be adjusted to meet the requirements.

The committee is attempting to determine the shrinkage of ballast by comparing the yardage loaded loosely in cars at the point of origin, where it is paid for, with the yardage of the same material tamped and compacted in track under the passage of trains. It is of the opinion that this can only be determined by prolonged tests being conducted on either old solidified roadbeds or on concrete trestles. It is hoped that this work can be done the coming year through the co-operation of those roads particularly which will construct new concrete trestles.

Attention was called to the subject, "Shrinkage of Ballast," as it appears on page 84, Volume 27, No. 277, Supplement to the Manual of 1921, as same has been set forth by H. E. Hale, vice-chairman of the Eastern Group of the Presidents' Conference Committee. The committee did not make any recommendationsn as to the data therein, but is of the belief that it is very valuable, and called particular attention to the following paragraph:

"The difficulty of measuring with reasonable accuracy the shrinkage of ballast is due to the usual practice of ballasting a road piecemeal and to the general practice of keeping no record of the location of ballast bought under various contracts from various pits."

The committee has found this difficulty to exist, and it is our belief that it can only be overcome by the committee itself being present when the ballast is weighed or measured, loaded, placed and tamped under the track.

Discussion

The work of the committee was outlined by Chairman Paul Hamilton (C. C. C. & St. L. R. R.) and by Sub-Committee Chairmen L. L. Adams (L. & N. R. R.) and E. I. Rogers (P. & P. U. R. R.), who briefly reviewed their respective reports which were then accepted without further discussion and the committee excused with thanks.

Editorial Comment

The Value of Goodwill

A service rendered by properly a managed trade association, often overlooked, is the building up of goodwill for the industry it represents. Just as in the case of individual industrial concerns, the goodwill that an industry gains is a capital asset of unquestionable, but of unappraisable value. One can never tell when this asset will be needed, or how much its value is, until some crisis or emergency demonstrates its presence, or perhaps its absence.

Doubtless many and involved problems of economics, such as over-capacity, union vs. non-union labor, etc., are prime causes of the present condition of the coal industry, but one cause that is just as real, and not much talked about, is the total absence of goodwill, both as regards the industry as a whole and as regards most of its individual producers. The public has not forgotten the advantages taken of it in times past, in periods of alleged coal shortage—by both operators and the mine union labor.

As reputation is to an individual, so is goodwill to an industry; once lost it is exceedingly hard to regain. Goodwill, all will agree, is the result of the constant application of fair, honest, honorable and ethical practices and favorable publicity. And the practice begins at home. Competitors cannot at the same time cut each others throats and be fair and honorable in their dealings with the rest of the public. Competitors cannot abuse their relations with employes and at the same time win public recognition as fair business men. Irrespective of the merits on the side of the coal producers they will get little public sympathy because they once, in the immediate past, did not consider public sympathy, or goodwill, worth making a little sacrifice of immediate profits for. It is to be hoped other industries will profit by this example; and use their trade associations to foster common honesty and ethics as well as more directly to foster the sale of their products.

No Excuse for Poor Concrete

One of the features of the recent American Concrete Institute meeting was the frankness of speech regarding some of the shortcomings of concrete. In former days, when concrete construction was young and had its way to make, those interested in its progress kept off the subject of failures and disintegration and stressed the virtues of the material. But now that concrete has arrived the case is different. One speaker at the Institute told his hearers quite frankly that the reasons why certain architects were still shy of using concrete for certain classes of construction was that they could see so much cracked and disintegrating concrete around them, and he illustrated his remarks with lantern slides of pictures, mostly taken with a pocket camera while walking between his home and his office.

However, we know that all important structures today are of good concrete, and there are some that are old enough to justify the Portland Cement Association's slogan, "Concrete for Permanence." It is even more permanent than some limestones and some sandstones of which private and public buildings have been made. The condition of some of these has called for extensive repairs and caused grave concern in the case of public buildings. It is interesting to note that concrete is the material chosen for repairing them. The spalling "brown stone fronts" of many old houses have had to be patched with concrete stucco, and many a natural stone doorstep has crumbled under the weather to be replaced by good concrete. Many miles of flagstone sidewalks have had to be replaced by concrete, as much because they shelled off and disintegrated as because they were worn. Compare with this the long stretches of sidewalk in Chicago, for example, where the dates placed on them by the contractor attest that he did a good, honest job of concrete years ago.

Today there is no excuse for poor concrete, since the methods of making good concrete can be known to anyone who asks, and the materials, standard portland cement and cleaned and screened sound aggregates, may be had anywhere. The contractor who puts in poor concrete is almost criminally ignorant and stupid, or he is dishonest. The worst enemy that the producers of cement and aggregate have today is the man who will use dirty and poorly graded aggregate because it is a few cents cheaper a ton and the man who will steal cement, knowing that the job will probably hold together long enough for him to get his money. And they are quite as much enemies of the honest and intelligent contractor as they are of the producer.

The ignorant and the stupid man is harder to handle than the man who is dishonest, but much is being done to eliminate him. The big end of this work is being done by the Portland Cement Association, the Institute and trade magazines in educating the public. But there is more to do in the way of getting better building codes adopted (the Institute brought out an excellent basis for such codes at the recent meeting), insuring better inspection, insisting on sound engineering, putting the back-yard products man out of business, backing up the good contractors and opposing the others and at all times and seasons protesting against the use of poor aggregates, too much water for the cement content, and carelessness in mixing, placing and curing.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. com.[37]	12-30-27	3	7	
Allentown P. C. 1st 6's[37]	12- 5-27	90	92	
Alpha P. C. new com.	3- 8-28	38	42	75c quar. Jan. 14
Alpha P. C. pfd.	3- 8-28	115	.....	1¾% qu. June 15
Am. L. & S. 1st 7's[22]	2-24-28	101¾	102½	
Arundel Corp. new com.	3-12-28	47½	47¾	50c q., $1 x. Jan. 16
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	3-13-28	108	112	
Atlas P. C. com.[2]	3- 8-28	41	44	50c qu. Mar. 1
Atlas P. C. pfd.	3- 8-28	43	.....	2% qu. Jan. 3
Beaver P. C. 1st 7's	7-29-27	100	100	
Bessemer L. & C. Class A[4]	3-12-28	36	37	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	2-24-28	100¼	.....	
Boston S. & G. com.	2-29-28	77¼	.....	$1 qu., $1 x. Jan. 2
Boston S. & G. pfd.	2-24-28	80	85	1¾% qu. Jan. 1
Boston S. & G. 1st pfd.	2-24-28	90	95	2% qu. Jan. 1
Canada Cement com.	3-12-28	31½	33¼	
Canada Cement pfd.	3- 9-28	99½	100	1.62½ qu. Mar. 31
Canada Cement 5½'s	2-21-28	102¼	.....	
Canada Cr. St. Corp. 1st 6's	3- 9-28	96	100	
Chas. Warner com.	3- 7-28	37	40	.50 q., .50 x. Jan. 12
Chas. Warner pfd.	3- 7-28	108	110	1¾% qu. Jan. 26
Cleveland Stone new st'k	3-12-28	74½	75	.50 q., 50 x. Dec. 1
Consol. Cement 1st 6½'s, A[24]	3-13-28	92	99	
Consol. Cement 6½ notes[24]	3-13-28	94	99	
Consumers Rock & Gravel 1st 7's[18]	3- 9-28	99	101	
Coosa P. C. 1st 6's[32]	12-28-27	65	75	
Coplay Cem. Mfg. 1st 6's[40]	3- 1-28	90	.....	
Coplay Cem. Com.[40]	3- 1-28	12½	.....	
Coplay Cem. pfd.[40]	3- 1-28	72½	.....	
Dewey P. C. 1st 6's[30]	3-13-28	99	101	
Dolese & Shepard[7]	3-12-28	150	.....	$2 Apr. 1, $1.50 ex. Apr. 1
Edison P. C. com.[39]	2-24-28	50c	.....	
Edison P. C. pfd.[39]	2-24-28	1	.....	
Edison P. C. bonds[39]	2-24-28	75	.....	
Egyptian P. C. pfd.[21]	3- 8-28	90	95	1¾% qu. July 1
Egyptian P. C. war.[21]	3- 8-28	No market		
Fredonia P. C. 1st 6½'s[32]	12-28-27	97	101	
Giant P. C. com.	3- 8-28	30	35	
Giant P. C. pfd.	3- 8-28	35	45	3½% Dec. 15
Ideal Cement com.	3-12-28	97	99	$1 q., $1 x. Jan. 1
Ideal Cement pfd.[33]	3-12-28	109	111	1¾% qu. Jan. 1
International Cem. com.	3-12-28	67⅛	68⅛	$1 qu. Mar. 30
International Cem. pfd.	3-12-28	108	110	1¾% qu. Mar. 30
Kelley Is. L. & T. new st'k	3-12-28	50	51½	2% qu.
Lawrence P. C.[2]	3- 8-28	108	112	1½% qu.
Lehigh P. C.	3- 8-28	50	51	62½c qu. Jan. 1
Lehigh P. C. pfd.	2-28-28	107	108	
Lyman-Richey S. & G. 1st 6's, 1931[13]	8-12-27	99¼	100	
Lyman Richey S. & G. 1st 6's, 1935[13]	8-12-27	97½	99	
Marblehead Lime 1st 7's[14]	3- 9-28	100	.....	
Marbleh'd Lime 5½'s, notes[14]	3- 9-28	98	.....	
Mich. L. & C. com.[6]	3- 8-28	35	.....	
Mich. L. & C. pfd.[6]	3- 8 28	24	26	1¾% qu. July 15
Missouri P. C.	3-12-28	38	39	50c Feb. 1
Monolith P. C. com.[9]	3- 9-28	15	.....	8% ann. Jan. 2
Monolith P. C. pfd.[9]	2-24-28	9¼	9½	
Monolith P. C. units[9]	2-24-28	33¼	34¼	
National Cement 1st 7's[38]	3- 9-28	96	99	
National Gypsum com.[35]	3-12-28	18	22	
National Gypsum pfd.[35]	3-13-28	63	68	
Nazareth Cem.[20]	3- 9-28	32	34	75c qu. Apr. 1
Newaygo P. C.[1]	12-30-27	115	.....	
Newaygo P. C. 1st 6½'s[23]	2-11-28	120	.....	
New Eng. Lime pfd., A[14]	3- 9-28	.....	95	
New Eng. Lime pfd., B[32]	3- 9-28	96	98	
New Eng. Lime, V.T.C.[32]	3- 9-28	32	36	
New Eng. Lime 1st 6's[14]	3- 9-28	98	100	
N. Y. Trap Rock 1st 6's[32]	3-12-28	102	102	
North Amer. Cem. 1st 6½'s	3-12-28	92⅛	93	
North Amer. Cem. units[19]	3-12-28	55	61	2 mo. per. at 7%
North Amer. Cem. com.[19]	3-12-28	10	12	
North Amer. Cem. pfd.[19]	3-12-28	50	55	$1.75 qu. Aug. 1
North Shore Mat. 1st 6's[15]	3-13-28	99	.....	
Northwestern States P. C.[37]	11-21-27	165	170	
Pac. Coast Cem. 6's, A	2-17-28	95½	.....	
Pacific P. C. new com.	3- 9-28	.....	24¾	
Pacific P. C.[5]	10-21-27	61¾	.....	25c mo.
Pacific P. C. pfd.	3- 9-28	78	80	
Pacific P. C. notes[5]	2-25-28	.....	99½	3% s.-a. Oct. 15
Peerless P. C.[1]	3-11-28	1	1½	
Penn-Dixie Cem. 1st 6's[29]	3-12-28	100¼	100¼	
Penn-Dixie Cem. pfd.[29]	3- 1-28	96⅜	.....	1¾% Mar. 15
Penn-Dixie Cem. com.[29]	.....	25¼	25⅜	50c April 1
Petoskey P. C.[1]	3-12-28	12½	13½	1½% qu.
Pittsfield L. & S.[31]	10- 8-27	.....	100	
Pittsfield L. & S. com.[31]	10- 8-27	.....	25	
Riverside P. C.	3- 9-28	180	200	50c mo., $1.50 x. Aug. 1
Rockland-Rockport Lime 1st pfd.[34]	3- 9-28	.....	100	3½% s.-a. Feb. 1
Rockland-Rockport Lime 2nd pfd.[34]	3- 9-28	.....	65	3% s.-a. Feb. 1
Rockland Rockport Lime com.[34]	3- 9-28	.....	50	1½% qu. Nov. 2
Sandusky Cem.	3-12-28	175	185	$2 qu., $4 x. Jan. 1
Santa Cruz P. C. bonds[5]	3- 9-28	.....	105¾	6% annual
Santa Cruz P. C. com.[5]	3- 9-28	87	90	$1 qu., $1 x. Jan. 1
Schumacher Wallboard com.	3- 9-28	24½	.....	
Schumacher Wallboard pfd.	3-29-28	.....	26¾	
Southwestern P. C. units	5-11-27	205	.....	
Superior P. C., A[20]	3- 9-28	46¾	47	
Superior P. C., B[20]	3- 9-28	33½	35	
Trinity P. C. units[27]	3-10-28	152	157	
Trinity P. C. com.[37]	12-19-27	50	60	
United Fuel & Sup. 1st 6's[27]	7-14-27	98	100	
United Fuel & Sup. notes[27]	7-14-27	98	100	
U. S. Gypsum com.	3-12-28	73½	74	40c qu. Mar. 31
U. S. Gypsum pfd.	3-12-28	122	123	1¾% qu. Mar. 31
Universal G. & L. com.[3]	3-13-28	.....	4	
Universal G. & L. pfd.[3]	3-13-28	68	72	1½% Feb. 15
Universal G. & L., V.T.C.[3]	12- 7-28	3	3½	
Universal G. & L. 1st 6's[3]	3-13-28	68	72	
Upper Hudson Stone 1st 6's, 1951[32]	12-28-27	92	.....	
Vulcanite P. C. 1st 7½'s[22]	12- 5-27	105	109	
Whitehall Cem. Mfg. com.[36]	3- 9-28	150	.....	
Wisconsin L. & C. 1st 6's[15]	3-13-28	100	.....	
Wolverine P. C. com.	3-12-28	6	6	15c Feb. 15
Yosemite P. C., A com.	1- 4-28	6	.....	

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willet, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trst Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
Asbestos Corp. of Amer., 5 sh. pfd., 5 sh. com.[1]	$1 for the lot	.....
Atlanta Shope Brick and Tile Co[3]	25c	.....
Benedict Stone Corp. (cast-stone), 50 pfd., 390 com.[1]	$400 for the lot	.....
Blue Stone Quarry, 60 sh.[2]	$10¼ for the lot	.....
Eastern Brick Corp., 7% cum. pfd.[1]	40c	.....
Eastern Brick Corp. (sand lime brick) com.[1]	40c	.....
International Portland Cement Co., Ltd., pfd.	30	45
Globe Phosphate Co., $10,000 1st. mtg. bonds, $169.80 per $1000 paid on prin.	$50 for the lot	.....
Iroquois S. & G. Co., Ltd., 2 sh. com., 3 sh. pfd.[1]	$12 for the lot	.....
Knickerbocker Lime Co.[4]	100	.....
Limestone Prod. Corp., 150 sh. pfd., $50 par, and 150 sh. com., no par	$60 for the lot	.....
Missouri Portland Cement Co., 7% serial bonds	104¾	104¾
Olympic Portland Cement Co.[7]	.....	£1⅝
Phosphate Mining Co.[1]	1	.....
River Feldspar & Mill'g Co., 50 com., 50 pfd.[2]	$200 for the lot	.....
Rockport Granite Co., 1st 6's, 1934	90	.....
Simbroco Stone Co.[3]	12	12
Southern Phosphate Co.[6]	1¼	.....
Standard Gypsum Co., 10 sh. pfd., 5 sh. com.[2]	$35 for the lot	.....
Tensas Gravel Co., 180 sh. con.[1]	$1 for the lot	.....
Tidewater Portland Cement Co., 3000 sh. com.	$6525 for the lot	.....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	.....
Wabash Portland Cement Co.[1]	60	100
Winchester Brick Co., pfd., sand lime brick[3]	10c	.....

[1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by R. L. Day and Co., Boston. [3]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass. [7]Neidecker and Co., London, England.

Ideal Cement Co. Annual Report

IDEAL CEMENT CO., Denver, Colo., for the year ended December 31, 1927, reports net earnings of $2,443,957, after depreciation and federal income tax, which after deduction for preferred dividends, unadjusted federal income taxes and other contingent liabilities, leaves a balance of $1,667,059, available for surplus and common dividends, equivalent to $8.33 per share on 200,056 shares of no par value common stock outstanding.

The following is from a letter of Charles Boettcher, president of the company, to the stockholders:

Use of cement in the United States during the year 1927 increased at the normal rate, but, according to statistics published by the Department of Commerce, only about 74% of the total potential capacity of all plants in the country was used. The production of your company's plants in 1927 was approximately the above percentage. The tendency for the last few years has been to create or increase capacities much faster than the increase in consumption, which, if continued, is bound to result in destructive competition and lower profits and, in some cases, actual loss to the manufacturer.

Your company enjoyed a satisfactory year both from the standpoint of volume of business and net profits, both of which showed increases over the year 1926.

The outlook for cement usage in 1928 is promising, but the rapid increase in productive capacities and the tendency to lower prices make it imperative, wherever possible, to reduce the cost of manufacture.

The management of your company is constantly seeking new methods and improved machinery to accomplish this result. Expenditures for improvements and extensions to plants, in addition to regular repairs and maintenance, during the year 1927 amounted to $1,861,420.

Your company has been for several years actively engaged in seeking to find and develop a reserve supply of natural gas in order to assure a continuance of cheap fuel in the future for the two plants at Ada, Okla. The company has acquired leases on a substantial acreage adjacent to the plants at Ada on which one gas well has been brought in, and the completion of another is expected shortly.

In December, 1927, the new plant at Boettcher, Colo., was completed and put in operation. This plant has a capacity in excess of 1,000,000 bbl. per year and your management feels that no more modern or efficient plant has ever been constructed. Our aim was to design a plant to manufacture cement of the highest quality and uniformity and, at the same time, reduce production costs. The results obtained since the plant has been in operation justify the conclusion that our aims have been fully achieved. All stockholders are cordially invited to inspect the plant when occasion presents.

During 1927 your company acquired title to an excellent site in the state of Arkansas, together with a large deposit of lime and shale, and contemplates the erection in due course of a modern cement plant to serve that territory. The company also purchased, at the same time, a controlling interest in the Graysonia, Nashville and Ashdown Railroad Co., on which line the new plant will be located.

Relations with our employes are excellent and show a splendid spirit of co-operation.

On April 1, 1927, the company retired $2,000,000 of its 7% cumulative preferred stock at the call price of $100 per share. This was accomplished without the issue of additional securities or obligations.

The company has no funded debt or bank loans and has ample working capital.

It will be noted from the balance sheet as of December 31, 1927, that a special reserve of $200,000 has been erected for unadjusted federal income taxes and other contingencies, which amount has been charged against net earnings for 1927.

CONSOLIDATED BALANCE SHEET OF IDEAL CEMENT CO. AND ITS SUBSIDIARY COMPANIES

(All Inter-Company Items Eliminated)

DECEMBER 31, 1927

ASSETS			LIABILITIES AND CAPITAL		
Cash, government and municipal bonds and marketable securities		$ 5,176,013.38	Liabilities		
Accounts receivable		476,633.25	Accounts payable	$197,734.76	
Manufactured goods		613,659.46	Dividends (payable January 1, 1928)	335,530.50	
Inventory, goods in process, supplies, fuel and sacks		1,315,063.38	Accrued liabilities	708,753.47	
Total current assets		$ 7,581,369.47	Total current liabilities		$ 1,242,018.73
Deferred charges		112,350.45	Reserves		66,318.78
Plants and Properties			Special reverse for unadjusted federal income taxes and other contingent liabilities		200,000.00
Plants and equipment	$20,307,376.20		Stock of sub-companies not owned		25,000.00
Less depreciation	2,430,946.88	17,876,429.32	Capital		
Land	$ 1,108,744.85		Preferred stock		7,741,400.00
Less depletion	48,449.36	1,060,295.49	Surplus represented by 200,056 shares of no par value common stock		17,355,707.22
Total		$26,630,444.73	Total		$26,630,444.73

EARNINGS STATEMENT

Net earnings from operation after depreciation and federal income taxes	$2,003,663.01
Miscellaneous earnings aside from cement manufacture	440,294.43
	$2,443,957.44
Less special reserve for unadjusted federal income taxes and other contingent liabilities	200,000.00
	$2,243,957.44
Less preferred stock dividends	576,898.00
Balance of net earnings available for surplus and common stock dividends	$1,667,059.44

Equivalent to $8.33 per share on 200,056 shares of no par value common stock outstanding.

Dolese & Shepard 1927 Earnings Increased

THE directors of the Dolese and Shepard Co. have declared a quarterly dividend of $2 per share and an extra dividend of $1.50 per share on the outstanding $957,400 capital stock, par $50, both payable April 1 to holders of record March 21. Previously the rate was $1.50 per share quarterly, and in addition an extra of $1.50 per share was paid on January 1 last.

DOLESE AND SHEPARD CO. INCOME ACCOUNT

Years ended December 31—	1927	1926
Net sales stone	$881,545	$735,665
Cost of stone sold	527,977	450,438
Bond interest and expense	104,032	97,997
Net profit	$249,535	$187,230
Miscellaneous income, less miscellaneous expenses	116,083	118,666
Gross income	$365,618	$305,896
Reserve for income tax	48,600	42,000
Net income	$317,018	$263,896
Dividends	191,480	162,758
Surplus	$125,538	$101,138
Earnings per share on 19,148 shares capital stock	$21.79	$13.78

Universal Gypsum and Lime Company's Annual Report

THE annual meeting of the stockholders of Universal Gypsum & Lime Co. was held in Chicago recently. Joseph N. Babcock, vice-president of the Equitable Trust Co. of New York and one of the active directors of Universal, was elected to preside at the meeting. He explained that, because of the fact the resignations of the former chairman of the board and former president of the company had been accepted, he had asked Guy E. Reed of the Harris Trust & Savings Bank, who had been in close touch with the affairs of the company, having served in an advisory capacity as a member of the operations committee of the company, to give a short report covering the present situation of the company.

Mr. Reed called attention to the fact that while the current financial position of the company, as shown on the consolidated balance sheet as of December 31, 1927, is very satisfactory, because of an acute competitive situation during practically all of 1927 there has been a gradual falling off of prices. Increased capacity of competitive gypsum and lime plants and a shortage of business in comparison with previous years have combined to produce an unsatisfactory condition from the viewpoint of profits.

The operations for the year, before depreciation and depletion, show a profit of $72,459.15. Depreciation and depletion charges amount to $307,211.63, making the net loss for the year $234,752.48. There have been charged against the surplus account, items affecting previous years' operations, also additional depletion of leasehold rights amounting to $97,769.29, leaving in the surplus account, after giving effect to the charges mentioned, the amount of $503,295.96. All sinking fund and bond interest requirements have been paid to date.

Mr. Reed also mentioned the purchase on January 3, 1928, of the stock of the Higginson Manufacturing Co. of Newburgh, N. Y., and Nova Scotia, emphasizing the fact that the Higginson company manufactures finishing, moulding and dental plaster and that by this acquisition the company is

now in a better position, in the way of products, to fully cover the Eastern territory.

The following directors were elected to serve during the year 1928: L. E. Armstrong, Joseph N. Babcock, J. L. Baker, C. A. Brown, John D. Bruhn, R. E. Haire, Eugene Holland, Frank G. Krumholz, Oliver Mitchell, Carleton H. Palmer, Lowell M. Palmer, Jr., Reed C. Peters, R. G. Rankin, Thomas H. Slusser and E. A. Webber.

At the annual directors' meeting immediately following the stockholders' meeting Eugene Holland, building material dealer of Omaha, Neb., was unanimously elected as president of the company for 1928.

UNIVERSAL GYPSUM AND LIME CO.
CONSOLIDATED BALANCE SHEET
(As at December 31, 1927)
ASSETS

Current Assets:	
Cash	$ 155,764.92
Accounts receivable—due from customers, after deducting reserve for bad accounts	483,948.87
Other accounts receivable—advances to employes, stock subscriptions, etc.	26,516.93
Inventories—stated at cost—finished product, raw materials, supplies and repair parts	628,009.19
Temporary investment—stated at cost	3,815.35
Total current assets	$1,298,055.26
Deferred charges to future operations unamortized bond discount, prepaid expenses, etc.)	525,700.63
Sinking funds deposited with trustee..	45.39
Fixed assets:	
Lime and gypsum deposits after deducting depletion	$ 783,207.80
Land, buildings, machinery and equipment, after deducting reserve for depreciation of $730,346.48	3,725,289.79
Total fixed assets	$4,508,497.59
Leasehold rights (depreciated value)..	1,333,137.02
Good will, patents and patents pending	644,592.34
Total assets	$8,310,028.23

LIABILITIES AND CAPITAL

Current liabilities:	
Accounts payable	$ 91,658.72
Notes payable	15,195.00
Accrued interest, salaries, wages, etc.	105,561.55
Total current liabilities	$ 212,415.27
Unearned royalties	5,000.00
Real estate mortgage	3,900.00
First mortgage 6% 20-year sinking fund gold bonds	1,853,800.00
7% cumulative preferred stock	4,000,000.00
Common stock (without par value represented by 229,790 shares)	1,431,617.00
8% cumulative preferred stock of the Insulex Corporation	300,000.00
Capital surplus (arising from valuation of leasehold acquired less subsequent adjustments and losses charged thereto)	503,295.96
Total liabilities and capital	$8,310,028.23

Certain-teed Products Corp. Debentures Sold

BLAIR & CO., INC., W. A. Harriman & Co., Inc., Hayden, Stone & Co., Hambleton & Co., Federal Securities Corp. and Central Trust Co. of Illinois have sold at 98½ and interest, to yield 5⅝%, $13,500,000 20-year 5½% sinking fund gold debentures, series A, of the Certain-teed Products Corp.

The following data are from a letter of George M. Brown, president of the company:

Business—Originally established in 1904, comprises the manufacture and sale of prepared roofings, floor coverings, gypsum products, paints and various allied lines. Corporation ranks as the largest manufacturer in the United States of prepared (asphalt) roofings and in its other lines is an important factor, its products being sold for the most part under the trade name "Certain-teed."

New Acquisition—Corporation proposes presently to acquire the assets and business of the Beaver Board Cos. and the Beaver Products Co., Inc., which are engaged principally in the manufacture and sale of gypsum products, wood fibre products and prepared roofings.

Financial Plan—In connection with the acquisition of the Beaver Board properties and to provide for future development, the corporation has adopted the following financial plan (a) the retirement of the existing first and second preferred stock and the creation of a single new preferred stock issue; (b) the issue of $13,500,000 debentures and (c) the issue and sale of an additional amount of common stock.

Capitalization—	Authorized	Outstanding
20-year 5½% sinking fund gold deb.	$25,000,000	$13,500,000
7% cumulative pref. stock	25,000,000	6,309,200
Common stock (no par value) (shares)	1,000,000	400,000

There will also be outstanding $262,500 purchase money obligations and $350,000 mortgage bonds of a controlled company.

The amount of the preferred stock to be outstanding may be increased by a moderate amount to the extent that holders of the preferred stock of the Beaver Board Cos. elect to take new preferred stock in lieu of cash.

Earnings—The combined net earnings of Certain-teed Products Corp. and of the Beaver Board Cos. and subsidiaries, eliminating certain non-recurring charges, based on audited reports of the respective companies, have been as follows:

Year	Net profits*	Depreciation and depletion	Bal. available for interest and federal taxes
1925	$5,107,170	$1,407,098	$3,700,072
1926	5,152,506	1,460,794	3,691,712
1927	5,267,986	1,540,094	3,727,893

*After deducting underlying interest and Canadian income taxes, but before depreciation, interest on these debentures and federal taxes.

BALANCE SHEET DECEMBER 31, 1927
(After Present Financing
ASSETS

Cash in banks and on hand	$ 4,334,871
Notes receivable	336,950
Accounts receivable, less res.	5,076,525
Inventories	6,985,066
Investment in and advance to Beaver Products Co. of Virginia, Inc.	355,297
Miscellaneous accounts and notes receivable, investments, etc.	210,343
Expenses paid in advance	418,791
Plant property and equipment, etc.	26,584,536
Good will, trade marks, etc.	1
Total assets	$44,302,380

LIABILITIES

Accounts payable	$ 1,530,828
Dividends, paid January 1, 1928	425,912
Accrued federal, etc., taxes	502,193
Miscellaneous reserves	500,000
20 year 5½% debentures	13,500,000
Purchase money mortgage bonds, 6%	262,500
Preferred stock of subsidiaries not held	147,500
7% preferred stock	6,309,200
Common stock (400,000 shares of no par)	17,370,000
Capital surplus	1,145,582
Earned surplus	2,608,663
Total liabilities	$44,302,380

Sinking Fund—On March 1, 1929, and semi-annually thereafter on March 1 and September 1 in each year, the corporation, as a sinking fund, will deliver for cancellation or pay to the sinking fund agent $200,000, of series A debentures or cash sufficient to retire that principal amount of the series A debentures. The cash so paid is to be applied to the purchase of series A debentures at not exceeding the redemption price prevailing on the next succeeding interest payment date, or, to the extent not so applied, to the redemption of debentures by lot at that price on the next interest payment date. Corporation shall have the right to exceed any sinking fund payment and to have the excess payments credited against any subsequent sinking fund payment or payments required to be made. All debentures acquired by the sinking fund are to be cancelled. The operation of the sinking fund will retire over 55% of the series A debentures by maturity.

Listing—Application will be made to list these debentures on the New York Stock Exchange.

Redemption of First Preferred and Second Preferred Stock on May 1—The corporation will redeem on May 1, 1928, all of its outstanding first preferred stock and second preferred stock, other than stock theretofore deposited with Blair & Co., Inc., for exchange for new 7% preferred stock pursuant to the offer set forth in the letter dated January 25, 1928, to the holders of its first preferred stock and second preferred stock. On May 1, 1928, each holder of shares of either or both of said two classes of stock should present his certificate or certificates therefor, duly endorsed, at the office of Blair & Co., Inc., 24 Broad street, New York City, whereupon he will become entitled to receive payment for the shares which are represented by such certificate or certificates at the redemption price of 120 and dividends for the first preferred stock and 110 and dividends for the second preferred stock.

Penn-Dixie Report

THE report of the Pennsylvania-Dixie Cement Corp. and subsidiaries for the year ended December 31, 1927, shows net profit of $1,967,493 after depreciation, depletion, interest, federal taxes, etc., equivalent after 7% preferred dividends to $2.64 a share earned on 400,000 no par shares of common stock.

Large Cement Consolidation Rumored Under Way

A MERGER of Pennsylvania-Dixie Cement Corp. and North American Cement Corp. was reported in Wall street to be near completion, announcement of the terms being expected shortly. The pending consolidation is believed to be a forerunner of a larger unit embracing International Cement Corp. This would give to the consolidation plants in Argentina, Uruguay and Cuba, thereby creating a concern that would have output of favorable comparison with such companies as Lehigh, Universal, Atlas and Alpha.—*Chicago* (Ill.) *Tribune.*

Cleveland Stone Extras

THE directors of the Cleveland Stone Co. have declared an extra dividend of 25 cents per share (in addition to the regular quarterly dividend of 50 cents per share), payable March 1 to holders of record February 15. An extra dividend of 50 cents per share was paid December 1 as compared with an extra of 25 cents per share in each of the three preceding quarters.

Comparative Tests of Crushed-Stone and Gravel Concrete

Report on Co-operative Tests Conducted by the New Jersey State Highway Commission and the U. S. Bureau of Public Roads

By F. H. Jackson
Engineer of Tests, Division of Tests, U. S. Bureau of Public Roads

DURING the summer of 1926 the New Jersey State Highway Commission, working in co-operation with the Bureau of Public Roads, conducted a series of concrete tests at the Trenton laboratory of the commission, for the purpose of determining the relative quality and economy of concrete paving mixtures in which 13 different gradations of crushed stone (trap rock) and gravel were used as coarse aggregate. The investigation involved the making and testing of approximately 150 concrete beams, 8 by 8 by 48 in. in size and 250 concrete cylinders 6 by 12 in. in size.

This report describes in order (1) the various reasons which led up to the investigation, (2) the procedure followed, (3) the results secured, and (4) the conclusions reached, and makes certain recommendations relative to the application of these results. It should be borne in mind that this series of tests was initiated for the purpose of studying the relative merits of two different types of coarse aggregate produced under certain conditions. The results can therefore be considered as applicable only to the same kinds of material, produced in a similar manner. In order to make possible to drawing of more general conclusions as to the effect of type and gradation of coarse aggregate upon the quality of concrete a series of tests has been started at the Arlington laboratory of the bureau. These tests are similar to those described here but involve 17 types of coarse aggregate instead of two. It is anticipated that conclusions suitable for general application will be justified by these tests, but in the meantime those presented here should not be considered as having any application beyond the particular conditions involved.

Reasons for Investigation

The practice followed in New Jersey and most other states of specifying the same proportions of cement and graded aggregate for concrete, regardless of the void content of these aggregates, has resulted in securing for gravel aggregate an appreciable economic advantage due to the increased yield of concrete obtained from the gravel aggregate on account of its low void content, as well as its lower cost compared with that of crushed stone. These facts, together with the other natural advantages possessed by gravel, such as the increased workability of the resulting concrete, have made its use in general more economical than crushed stone.

Such a condition would not in itself warrant any change in the existing methods of proportioning. It must be remembered, however, that the arbitrary proportions which are set are only a means to an end which, in this case, is the production of concrete possessing certain definite essential physical properties. If a specification is to be considered adequate it must be assumed that, as long as the various details of the specifications relative to materials and construction processes are complied with, concrete of substantially uniform quality will be obtained: in other words, that any variation in either type or gradation of aggregate within the specification limits will not result in any essential change in the quality of the product.

The standard road specifications of the New Jersey Highway Commission require that concrete for pavements shall be mixed in the proportions of 1 part cement to 1¾ parts sand and 3½ parts coarse aggregate by volume measured in a loose, dry condition. In the determination of the field mix, the amount of sand is proportioned on a dry, loose basis; that is, a bulking correction is made. Either crushed rock or gravel conforming to certain requirements as to quality and gradation may be used. This, as has been pointed out, results in the production of more concrete per unit volume of cement when gravel is used as coarse aggregate than when stone is used, due of course, to the higher void content of the crushed stone aggregate.

It has been repeatedly urged by the crushed-stone interests in New Jersey that concrete produced from crushed stone is of a better quality than that produced from gravel due to the difference in character of these two aggregates and to the higher cement content of the stone concrete, as expressed in terms of volume of cement required to produce a unit volume of concrete.

If these claims are true, they are of considerable significance, because it means that, if the gravel concrete produced under the present specifications is satisfactory in quality, the use of crushed stone results in the production of a higher quality of concrete than is demanded by the minimum requirements of the specifications. If, on the other hand, the crushed-stone concrete is no better than it should be, the obvious conclusion is that the gravel concrete will not meet the minimum requirements. In either event, if it is shown that the type of aggregate does affect the quality of the concrete to an appreciable degree, some readjustment should be permitted in order to insure concrete of equal quality irrespective of the type of aggregate used.

Scope of Tests and Materials

Recognizing the importance of this problem from both the engineering and economic points of view, the Bureau of Public Roads and the New Jersey State Highway Commission undertook a study of the question through a series of carefully controlled laboratory tests to determine the following:

1. The relative strength and yield of crushed-stone and gravel concrete of the same proportions and consistency, and with the same size and grading of coarse aggregate.

2. What grading of coarse aggregate and what proportions of fine to coarse would give the greatest yield for each type of aggregate, when the concrete is designed for a given strength.

In discussing the essential characteristics of paving concrete, it is herein assumed that insofar as strength is concerned, resistance to bending or flexure is of more significance than is resistance to crushing. Many engi-

Editor's Note

THIS is but a brief synopsis of the report published in full in the February issue of "Public Roads," the official journal of the U. S. Bureau of Public Roads. The report contains much detail in regard to the method of testing, etc. Our summary contains the salient points that all producers should know.—The Editor.

neers, in designing concrete pavements, employ the flexural strength of the concrete in calculations for edge and center thickness of slabs under given conditions of load and accept it as the criterion of quality rather than the compressive strength. It is obvious, therefore, that factors influencing flexural strength are of critical importance insofar as pavement concrete is concerned.

The crushed stone was obtained from Bound Brook, N. J., and the gravel from Morrisville, Penn. The rock is representative of the extensive deposits of basalt (trap rock) quarried in northern New Jersey. This material is very hard and tough, showing a percentage of wear of 2.2 (French coefficient equals 18.2), apparent specific gravity of 2.97 (weight per cubic foot, solid, 185 lb.), and a water absorption of 0.05%. The gravel is representative of material of the type used extensively throughout this region. It consists essentially of rounded fragments of sandstone, flint, and quartz, has an apparent specific gravity of 2.65 (weight per cubic foot solid, of 165 lb.) and a water absorption of 0.68%.

The fine aggregate used in the tests was also obtained at Morrisville, Penn., and meets all the conventional tests for first-grade concrete sand. Its apparent specific gravity was 2.65 (weight per cubic foot, solid, 165 lb., and its weight per cubic foot, dry, and shaken to refusal, 108 lb.).

The cement was a standard portland passing all physical test requirements. It was a brand used extensively in New Jersey.

Yield of Concrete Discussed

A study of the relative economy of various concrete mixtures, all of which may have the same strength, is just beginning to occupy the attention of engineers and progressive contractors. It was formerly assumed and is still stated in many handbooks that, for a given proportion of cement, sand, and coarse aggregate, definite amounts of materials are required to produce a cubic yard of concrete. While the values given may be correct as average values it is known that there are many factors which may appreciably alter any one or more of these quantities under certain conditions. In this report the writer is concerned primarily with the effect of type and gradation of coarse aggregate on yield.

Conclusions Presented

It is not intended that the conclusions given below and which are based on the results of these tests shall be considered as applicable to crushed trap rock and gravel of a different type and quality than those employed in this investigation, or to kindred aggregates produced and marketed under conditions differing from those used, and should not be interpreted as applying to crushed-stone or gravel aggregates in general. These conclusions are as follows:

1. That when coarse aggregates comparable in quality to those used in these tests are employed in the construction of concrete pavements in New Jersey under existing specifications:

(*a*) Concrete in which crushed trap rock is used as coarse aggregate will average about 12% higher in flexural strength than concrete in which gravel is used as coarse aggregate.

(*b*) There will be practically no difference in the crushing strength of crushed trap-rock concrete and gravel concrete.

(*c*) There will be practically no difference in the absorption of crushed trap-rock concrete and gravel concrete.

(*d*) For equivalent flexural slab strengths, a pavement constructed of gravel concrete should have a depth approximately one-half inch greater than a pavement constructed of crushed trap-rock concrete.

(*e*) The cost of the materials required for a unit volume of crushed trap-rock concrete will as a rule be greater than the cost of materials required for an equivalent volume of gravel concrete.

2. That when coarse aggregates comparable to those used in these tests are used in concrete mixtures designed for a given strength by the so-called water-cement ratio trial method:

(*a*) The flexural strength of the crushed trap-rock concrete will average about 11% higher than the gravel concrete.

(*b*) There will be practically no difference in the crushing strength of the crushed trap-rock concrete and the gravel concrete.

In addition to the above, the following indications as to effect of gradation on strength and yield when the concrete is proportioned by fixed volume as well as by the water-cement ratio theory may be stated:

(1) That the gradation of the coarse aggregate has very little direct effect upon the strength of the concrete.

(2) That when proportioned by the water-cement ratio trial method, variations in the fine-coarse aggregate ratio of from 1:2 to 2:3 do not affect the strength of the concrete for a given sand and for a given water-cement ratio.

(3) That variation in coarse aggregate grading will greatly affect the yield of concrete and therefore its cost, when the concrete is proportioned either in the usual way or by the water-cement ratio method.

(4) That the use of well-graded coarse aggregate will increase the yield when proportioned by the usual method, but exactly the reverse is the case when the concrete is proportioned by the water-cement ratio method.

Limitations of Conclusions

Special prominence is given to the following limitations of these experiments and the conclusions drawn from them:

"The conclusions drawn from these tests should not be interpreted as indicating that crushed stone as a type is superior to gravel as coarse aggregate for cement concrete pavements, but only as indicating that for the particular conditions and kinds of materials involved, concrete in which crushed trap rock was used showed an average flexural strength approximately 12% higher than similar concrete in which gravel was used.

"Tests now in progress at the Arlington laboratory using 17 different coarse aggregates give preliminary indications that materials similar to those used in this investigation will give similar results, but also that the characteristics of the particular aggregate used may be fully as important as the type of material to which it belongs."

Production of Stone in Canada in 1926

PRODUCTION of stone in Canada during 1926 totaled 6,397,590 tons, valued at $7,865,874, according to finally revised statistics just issued by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa. Shipments in 1926 amounted to 5,706,119 tons worth $7,464,777. Ontario was the leading producer, accounting for 56.7% of the total tonnage produced in 1926. Quebec followed with 36% and the other provinces in order of tonnage produced were: British Columbia, Manitoba, Nova Scotia, New Brunswick and Alberta.

Importations of stone into Canada during 1926 were valued at $1,144,614 as compared with an import value of $824,992 in 1925. Canadian stone exported reached a total of $194,588, including crushed stone to the value of $134,755.

The 233 firms operating in the stone quarrying industry in Canada during 1926 reported a capital investment of $12,760,078. Salaried employes and wage earners working during the year totaled 4510, and their combined earnings amounted to $3,763,726. Fuel and electricity consumed caused a further outlay of $514,374. Primary power in use during the year consisted of 247 units rated at 7379 hp. and in addition 518 electric motors with a rating of 17,756 hp. were in operation.

Good Roads and Gasoline

CONSUMPTION of gasoline by motor vehicles increased 12.4% during 1927, the American Road Builders' Association has estimated. The number of gallons of gasoline consumed in the United States totaled 11,565,490,000 gal., according to figures released by the association.

California led all states in the consumption of the fuel, the vehicles of that state burning 1,017,681,000 gal. The state of New York ranked second with 892,800,000 gal. The average national consumption per motor vehicle was approximately 550 gal. The total number of miles traveled, estimated on a basis of 13.5 miles per gallon, was placed at more than 150,000,000,000 miles.

Regional Safety Meetings Begun in Portland Cement Industry

Birmingham First of Expanded Series Planned by Cement Industry for 1928

THE FIRST of the 1928 series of twelve regional safety meetings, arranged by the Portland Cement Association for the operating departments of American cement mills, was held at Hotel Tutwiler, Birmingham, on Tuesday, February 28.

At the Birmingham meeting, quarry and mill safety measures were discussed and demonstrated by 96 delegates representing ten cement mills in the southeastern states, operated by the Alabama, Atlas, Lehigh, Louisiana, Pennsylvania-Dixie, Phoenix and Signal Mountain cement companies. J. W. Johnston, vice-president and general manager of the Alabama Portland Cement Co., acted as chairman of the local committee on arrangement, on which he was assisted by D. E. Goss, assistant superintendent, Atlas Portland Cement Co., Leeds, Ala.; R. H. MacFetridge, superintendent, Lehigh Portland Cement Co., Birmingham; A. D. Stancliff, general superintendent, Alabama and Louisiana portland cement companies, Birmingham and New Orleans; and H. O. Underhill, superintendent, Phoenix Portland Cement Co., Phoenixville, Ala. The Birmingham Safety Council and the Alabama Electrical League co-operated heartily.

Program for Birmingham Meeting

10:00 a.m. Registration—Assembly Room.

10:30 a.m. Meeting called to order by J. W. Johnston, Vice-President, Alabama Portland Cement Co., chairman of the local committee.

Report on Safety work in the Cement Industry in 1927. A. J. R. Curtis, Secretary, Committee on Accident Prevention, Portland Cement Association.

Moral Responsibility of Workmen to Avoid Accidents. Perkins J. Prewitt, Director, Birmingham Safety Council.

12:15 p.m. Luncheon, private dining room, mezzanine floor.

Prize-winning essay on Safety—Mildred McLaren, Birmingham Junior Safety Council.

A. J. R. Curtis, secretary of the committee on accident prevention, is in general charge of the regional meetings

2:00 p.m. Afternoon Session—Assembly Room—R. J. Hawn, Vice-President, Phoenix Portland Cement Corp., chairman.

Some Ways to Reduce Electrical Hazards. M. O. Howle, Engineer, Alabama Power Co.

Good Lighting as an Aid to Plant Safety. W. E. Allen, Manager, Alabama Electrical League.

Round Table Discussion of Current Safety Problems, led by: W. M. Cabaniss (Alabama), R. E. Merrell (Atlas), R. H. MacFetridge (Lehigh), A. D. Stancliff (Louisiana), Geo. B. Winn (Penn-Dixie, Clinchfield), R. A. Bechtold (Penn-Dixie, Kingsport), J. F. Uhlman (Penn-Dixie, Richard City), H. O. Underhill (Phoenix), R. F. Sullivan (Signal Mountain).

Competition by First Aid Teams in Prone Pressure Method of Resuscitation.

Judges: F. E. Cash and C. E. Saxon, U. S. Bureau of Mines, and P. J. Prewitt.

Competitors: Three teams (five men and captain each) representing the Birmingham plants of the Alabama, Lehigh and Phoenix companies.

6:30 p.m. Safety Dinner and Rally. J. W. Johnston, Vice-President, Alabama Portland Cement Co., Toastmaster.

Address: T. G. Brobston, President, Birmingham Safety Council.

Song Leader: M. H. Small, Portland Cement Association, Birmingham, Ala.

First Aid Demonstration

One of the most interesting features of the program was the competition in prone pressure method of resuscitation participated in by the first aid teams of the Alabama, Lehigh and Phoenix mills. The specific problem assigned to the teams was the resuscitation of a victim of electric shock. All three teams made splendid showings, the Lehigh being judged the winner, with the Alabama team a close second. The Phoenix team,

One of the sessions of the regional safety meeting at Birmingham, Ala.

John W. Johnston, vice-president and general manager, Alabama Portland Cement Co., Birmingham

which had only been organized the preceding Friday, made a showing which brought forth much favorable comment.

Mr. Johnston and his committee managed the meeting admirably. R. J. Hawn of the Phoenix company conducted the session in a manner which thoroughly convinced the meeting of his practical experience as an operator familiar with safety problems. J. H. Colton, vice-president in charge of operation of the Pacific Portland Cement Co., was a visitor during the morning and talked briefly but enthusiastically of safety work in the cement and plaster mills of California.

At the close of the morning session R. M. Thigpen, representing the insurance and labor departments of the state of Alabama, spoke favorably of the accident prevention work of the southern cement mills and extended the greetings and good wishes of the commissioner. He wished the Alabama mills the fullest measure of success in the great June No-Accident Campaign of 1928 and promised active support. The chairman in thanking Mr. Thigpen expressed the gratitude of the industry for a competent and active state department.

Safety Meeting Dinner

Lindley C. Morton, president of the Phoenix Portland Cement Corp., who was scheduled to act as toastmaster, was called out of town suddenly on account of urgent business, and Mr. Johnston, who described his predicament as "pinch hit" toastmaster, presided most effectively at the dinner. After a short program of music and entertainment Mr. Brobston made a masterful address interspersed with rare southern humor. The meeting closed with a pledge by all present to support the June No-Accident Campaign and, if possible, pull all southern plants through the month without an accident.

In the Birmingham meeting, as well as the eleven that are to follow, the National Safety Council and the American Red Cross are co-operating. The twelve programs include appearances by the leading operating heads and safety workers of the industry, as well as some of the most distinguished

William Moeller, general superintendent, Texas Portland Cement Co., who is to be chairman of the next regional meeting at Dallas, Texas

surgeons and safety engineers in the industrial safety field. In several of the meetings, heads of state industrial departments are assisting, and the electrical, explosives and several other industrial groups which have developed accident work pertaining to their own products, are generously contributing the time of their trained engineers and safety men.

Successful results obtained in the 1927 series of eight regional meetings is directly responsible for the large expansion of this worked planned for the present year. It is expected that representatives of at least 25 mills will attend the present various meetings, nearly double the number which participated last year.

Safety Meeting Series Interesting

Remaining meetings are scheduled to be held in the East at Phillipsburg, N. J., Albany, N. Y., Washington, D. C., and Pittsburgh; in the South at Dallas, Texas; in the Mid-West at Lansing, Mich., Indianapolis, Ind., La Salle, Ill., Des Moines, Iowa, and Kansas City, Mo., as well as at San Francisco for the far western mills. Time and place of the above have been definitely announced as follows:

Dallas, Texas—Baker Hotel, Friday, April 6, for the Texas mills. William Moeller, general superintendent, Texas Portland Cement Co., chairman of committee.

Lansing, Mich.—Olds Hotel, Thursday, April 12, for the Michigan mills, G. A. Lawniczak, superintendent, Alpha Portland Cement Co., Bellevue, Mich., chairman of committee.

La Salle, Ill.—Hotel Kaskaskia, Thursday, April 19, for the mills of Illinois and eastern Missouri. John Kelly, safety engineer, Marquette Cement Mfg. Co., chairman of committee.

Kansas City, Mo.—Baltimore Hotel, Tuesday, April 24, for the mills of Kansas, western Missouri, Nebraska and Oklahoma.

Des Moines, Iowa—Hotel Fort Des Moines, Tuesday, May 1, for the Iowa and Minnesota mills.

Phillipsburg, N. J.—Thursday, May 24, for mills of the Lehigh Valley and surrounding region. R. Frame, Alpha Portland Cement Co., Easton, Penn., chairman of committee.

Indianapolis, Ind.—Indianapolis Athletic Club, Tuesday, June 5, for the mills of Indiana and Kentucky. D. S. MacBride, vice president, Indiana Portland Cement Co., chairman of committee.

Albany, N. Y.—Hotel Ten Eyck, Tuesday, June 12, for the eastern and central New York mills.

Washington, D. C.—Hotel Washington, Friday, June 15, for mills of the Chesapeake region.

Pittsburgh, Penn.—William Penn Hotel,

Russell Frame, Alpha Portland Cement Co., chairman of the regional safety meeting to be held at Phillipsburg, N. J., on May 24 next

Tuesday, June 19, for the mills of western Pennsylvania and Ohio. Geoff A. Saeger, chief chemist, Crescent Portland Cement Co., Wampum, Penn., chairman of committee.

San Francisco—For the California mills (date to be selected). W. H. George, secretary, Cowell Portland Cement Co., chairman of committee.

The Lansing meeting will be held in connection with the Michigan State Industrial Safety Conference, under the auspices of the State Department of Labor and Industry, Detroit Industrial Safety Council and allied organizations, which will occupy three entire days, April 12, 13 and 14. Practically every industry in the state is co-operating in this series of meetings and conferences. The meeting at Kansas City, similarly, is being organized in connection with the Second Annual Central States Safety Congress, which has the combined help of all accident prevention agencies and attracts attendance from states as far east as Ohio and as far west as the Rockies.

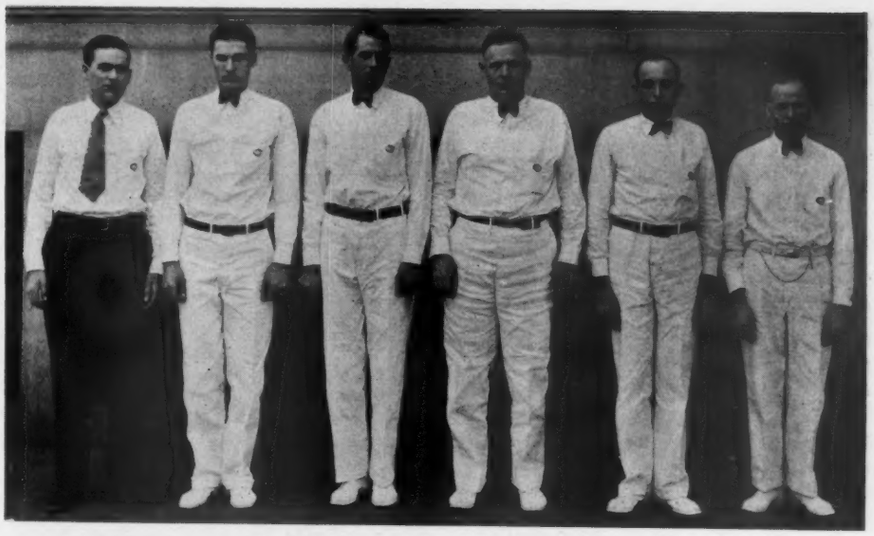
Programs completed and under way for this year's safety meetings in the cement industry contain features and include subjects not covered heretofore. More emphasis is being placed on the handling of plant safety meetings; electrical hazards and electrical accidents are dealt with more specifically; plant lighting and its effect on accidents will receive attention, and accidents causing severe burns will be discussed with suggestions for prevention and first aid in cases of serious burns.

Plant physicians are being invited to participate in first aid and emergency instruction, and at some of the meetings first aid teams from the plants will compete in demonstrating their efficiency in resuscitation work. Community safety work is also being stressed. The interest of the cement executives in safety work will be made known through the presence of leading officials of the various companies, many of whom will participate in luncheon and dinner programs.

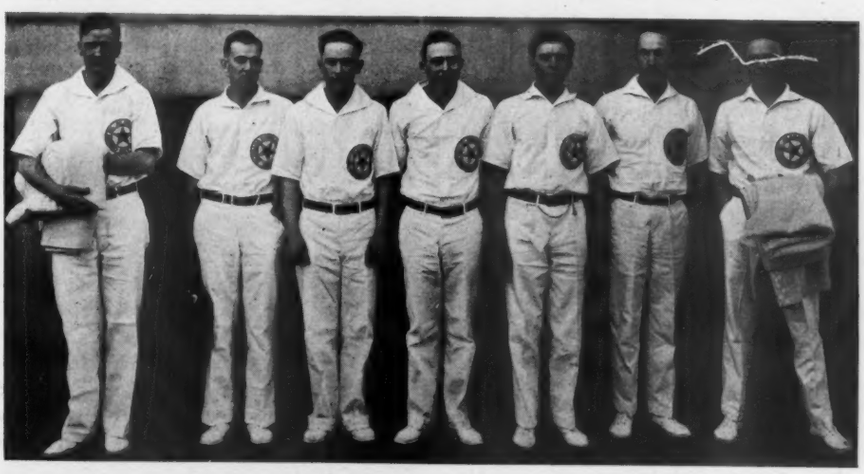
Industry Faces Big Task

Those who are familiar with the progress of accident prevention work in the cement industry during the past year or two must realize that in striving to beat past performance again in 1928 the industry has cut out a big job for itself. The relatively large proportion of new mills just getting into production naturally constitutes a big problem. At the end of 1926 only 124 plants were participating in the accident prevention work of the Portland Cement Association. Before 1927 had closed, 139 plants were actively co-operating, and 153 plants, within a few of all the mills on the continent, are actively engaged in this work at present.

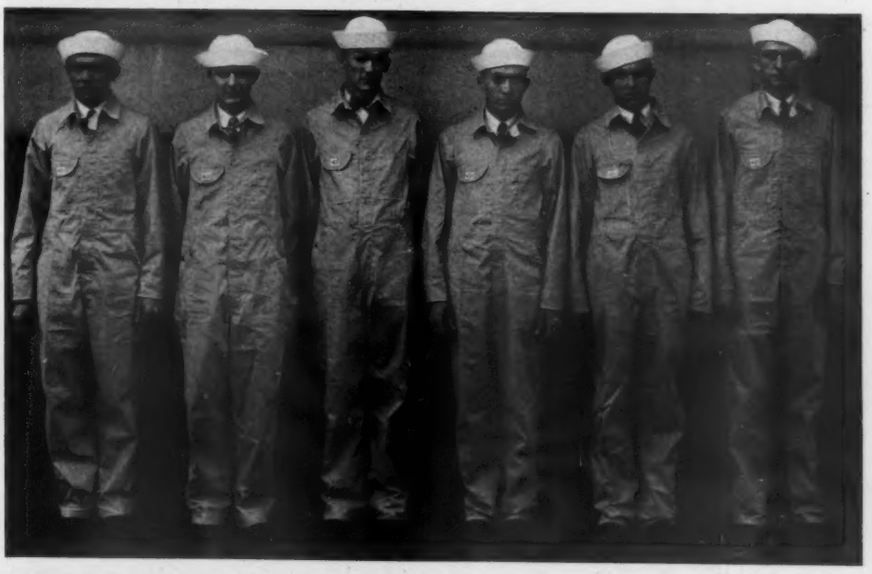
If the 1928 record depended only upon the performance of old and experienced mill organizations, there would be far less to worry about; but with many new mills added, some of them still in the construction stage, and with a considerable number



First aid team, Birmingham plant of the Lehigh Portland Cement Co., which was awarded first honors in the competition at the Birmingham meeting



First aid team of the Alabama Portland Cement Co., which gave the Lehigh team a spirited battle for first place at the Birmingham meeting



First aid team of the Phoenix Portland Cement Corp., recently organized to challenge its older competitors at the regional competition. The team made an excellent showing in rescuscitation work and is quite optimistic about its chances in 1929

of the older mills enlarged, improvement over the peak record of 1927 cannot be regarded as an easy matter. Consequently, one of the main objectives of the regional safety meetings this year is to train efficient mill safety organizations.

Those who watched the June drive last year, during which accidents were slashed to a minor percentage of the best previous record, are naturally asking, "Can the cement industry repeat?" If a positive answer can be given on July 1, it will be largely because the regional meetings, more than anything else, have been effective, for they are being depended on to produce the results. Prevailing enthusiasm for the regional meetings seems almost to guarantee the success of the June campaign.

Registration

Alabama Portland Cement Co., Birmingham
H. A. Black, assistant packing-house foreman.
A. J. Bowling, millwright.
R. L. Brake, Bayles, Ala.
W. M. Cabaniss, superintendent.
W. W. Deadman, mechanical engineer.
W. T. Dowdle, quarry foreman.
C. B. Hall, packing-house foreman.
J. M. Henderson, master mechanic.
J. H. Honeycutt, master mechanic.
J. W. Johnston, vice-president and manager.
Frank Jones, repairs.
Cecil Kyser, laboratory.
Frank Lehner, shop foreman.
John O'Callaghan, draftsman.
G. N. Pierce, chief electrician.
W. C. Powell, cost clerk.
A. W. Raab, purchasing agent.
A. D. Stancliff, general superintendent.
Paul Van Sandt, electrician.
Clinton Wood, dinky engineer.
H. M. Zimmerman, chief chemist.

Atlas Portland Cement Co., Leeds, Ala.
D. M. Gass, safety inspector.
B. E. Merrell, plant manager.
F. W. Talley, master mechanic.

Lehigh Portland Cement Co., Birmingham, Ala.
J. L. Akins, sub-station operator.
N. M. Bagby, blacksmith.
O. C. Brown, chief clerk, Bayles, Ala.
W. A. Craig, electrician, Tarrant, Ala.
I. W. Guncliff, master mechanic, Tarrant, Ala.
J. C. Giles, chief electrician.
R. E. Gudgen, chief timekeeper, Tarrant, Ala.
W. G. Hayden, quarry foreman, Tarrant, Ala.
I. H. Horn, machine shop foreman.
W. H. Jones, coal miller, Tarrant, Ala.
R. G. Lockridge, electrician.
V. C. Love, electrician.
J. H. McFarland, second burner, Tarrant, Ala.
R. H. McFetridge, superintendent Birmingham plant.
J. M. O'Brien, repair foreman.
Anzo Payton, burner, Tarrant, Ala.
Joe Rooker, miller.
H. E. Scoggins, packing-house foreman, Tarrant, Ala.
Charles D. Scott, mill foreman.

Louisiana Portland Cement Co., New Orleans, La.
R. M. Braden, chief clerk.
Thomas P. Homan, general mill foreman.
C. T. Kramer, packing-house foreman.
E. E. Marriott, chief electrician.
J. W. Morris, Jackson, Ala.
R. G. Sutherland, superintendent.

Pacific Portland Cement Co., San Francisco, Calif.
J. H. Colton, vice-president.

Penn-Dixie Portland Cement Corp., Kingsport, Tenn.
R. A. Bechtold, operating superintendent.
Kyle Dishner, machine shop foreman.
Charles S. Vance, assistant superintndent, Clinchfield, Ga.
George B. Winn, safety engineer.
Joe F. Fischer, chemist, Richard City, Tenn.
Tate O'Connor, draftsman.
C. L. Palmer, electrician.
J. F. Uhlman, safety director.

Phoenix Portland Cement Corp., Birmingham, Ala.
J. O. Breoux, supervisor packing.
Thomas C. Brown, electrician, Phoenixville.
G. C. Burgess, millwright.
F. I. Busby, foreman shale quarry.
M. H. Floyd, chief electrician.
John Fridley, machinist.
R. J. Hawn, vice-president.
W. N. Hubbard, Jr., shovel engineer, Phoenixville.
H. P. Hunber, quarry foreman.
H. L. McLain, shipping clerk, Fairfield, Ala.
C. C. Phillips, assistant superintendent.
Joe Price, repair man.
R. R. Roberts, chief draftsman.
Warren E. Siegfried, assistant treasurer.
H. Smith, yard foreman.
Fred E. Tuggle, chemist.
H. O. Underhill, superintendent.
R. L. Wills, storekeeper.
G. D. Youell, master mechanic.

Signal Mountain Cement Co., Chattanooga, Tenn.
J. M. Houtz, quarry foreman.
R. F. Sullivan, master mechanic.

Others
F. E. Cash, district engineer, U. S. Bureau of Mines, Federal Bldg., Birmingham.
C. E. Saxon, safety man, U. S. Bureau of Mines, Birmingham.
R. M. Thigpen, Workmen's Compensation clerk, State of Alabama, Montgomery, Ala.
Perkins J. Prewitt, director, Birmingham Safety Council.
H. G. Jacobson, Bates Valve Bag Corp., Chicago.
C. J. Luke, district manager, Bates Valve Bag Corp., Birmingham, Ala.
A. J. R. Curtis, Portland Cement Association, Chicago.
M. H. Small, district engineer, Portland Cement Association, Birmingham, Ala.

Calcium Hydroxide Crystals in Portland Cement

DURING a recent study on the hydration of tricalcium silicate by J. O. Draffin of the University of Illinois, it was observed that some of the crystals of calcium hydroxide which were formed in the solution were later dissolved in the solution from which they were crystallized, the temperature remaining the same as when they were formed.

The method of study was to mix some finely powdered tricalcium silicate, which contained only very small amounts of magnesium, aluminum and iron oxides, with distilled water on a glass slide, cover it with an object glass, and cement around the edges with Canada balsam. This left the tricalcium silicate in water which could not evaporate and from which the air was excluded. The progress of hydration on these slides was observed by means of a petrographic microscope.

In searching for an explanation of the unusual action of a crystal dissolving in the solution from which it was formed, a number of possibilities were considered and eliminated in due course.

R. H. Bogue, research director of the Portland Cement Association Fellowship investigation, suggested that the corrosion and solution of the crystals was caused by the soda-lime glass slides dissolving slightly, and, based on later experiments using quartz slides, it is believed that this is the correct explanation. No solutions of crystals occurred with the quartz slides, even after long periods.

The acceptance of this explanation raised the question as to what would be the effect on calcium hydroxide crystals in concrete when they were in contact with soda-lime minerals such as the feldspars. Experiments were therefore made in which finely powdered albite, labradorite, and anorthite were mixed with the tricalcium silicate on quartz slides, each mixture on a separate slide, to determine whether the feldspar would dissolve and cause the solution of the calcium hydroxide crystals. The addition of the feldspars did not cause corrosion of the calcium hydroxide crystals. Apparently the soda-lime glass is more susceptible to the action of calcium hydroxide than the soda-lime minerals.

Experiments with the feldspars mixed with the tricalcium silicate are being continued.—*Industrial and Engineering Chemistry.*

The Central Portland Cement Company of England

THIS company, which was formed in 1916, under another title, owns about 291 acres of freehold land at Kirton-Lindsey, Lincolnshire, on which its present works, consisting of two rotary kilns, have been erected. The works are the nearest cement factory to Sheffield, approached by rail or road. That they are situated one mile west of the ancient Roman Ermine street is of particular interest, for the trade mark of the brand of cement manufactured at the works is an actual reproduction of the head of Hadrian, taken from a large bronze coin of the second century found during quarrying operations at the works.

At the quarries are deposits of oolitic limestone, and underneath these 12 to 15 ft. of calcareous clay which, mixed in chemical proportions, produce a very fine quality of cement. Underlying the calcareous clay used for cement manufacture is found a stratum of hard blue oolitic limestone, which is used for road material. The clay contains so nearly the correct proportions, analytically, for the manufacture of portland cement that only a small proportion of the pure limestone has to be added, and the bulk of the raw material is intimately mixed by nature.

The quarrying of the clay is carried out by a mechanical digger and the material is delivered by rail to a mechanical washer, where it is washed and ground. Then it is carried by an elevator to a rapidly revolving screen separator, which takes out the coarser grains and returns them to a wet grinding mill. The finer washed material is conveyed to wet tube mills where it is ground fine.

The oolitic limestone is conveyed to a higher level, from which it is passed through crushers into a silo, from which it is automatically conveyed to a wet mill.

Ground clay and ground limestone are then carried to four concrete correcting basins of a total capacity of 300 tons. From these, after analysis for lime content, they are passed into four larger storing basins of a capacity of 600 tons. The fineness of the raw material and the lime content are tested every hour, and the correcting basins are constantly stirred mechanically. From the storage basins the mixture goes to the rotary kilns where it is clinkered, the clinker is passed to rotary cooling chambers, which are cooled by an electric fan. At the point where the raw slurry enters the kilns a further hourly check test of the raw materials is made. The two rotary kilns are each 150 ft. long and 8 ft. in diameter.—*Quarry and Surveyors and Contractors Journal* (England).

Foreign Abstracts and Patent Review

Calciner for Cement, Lime and Dolomite. The finely divided materials combined with gaseous, liquid or pulverized fuel and preheated combustion air are injected downwards or in a horizontal direction into a combustion chamber. The chamber is located below a steam boiler and the final product is withdrawn at the bottom between cooling tubes. *German Patent No.* 444,569.

X-ray Study of Magnesium Oxychloride Cement. An x-ray study of powdered magnesium oxychloride cements shows the presence of crystalline $3MgO \cdot MgCl_2 \cdot 12H_2O$ in the cement after setting. Magnesium hydroxide together with magnesium chloride solution yields a product in which definite crystalline structure could not be found, although it appears possible that imperfect crystals might be present. The diffraction lines of magnesium oxide cannot be found in the diffraction diagram of hardened cement. The presence of crystals in the cement is not, however, a confirmation of Le Chatelier's theory (Trans. Faraday Soc., 1919, **14**, 8), as these crystals may be of the dimensions of colloidal particles. *Sci. Papers Institute of Physical Chemistry, Tokyo* (1926), **5**, 95-102.

Treatment of Calcareous Stones with Sodium Silicate. Commercial sodium silicate solutions (*d.* 1.32) containing 33% of solid silicate ($Na_2O \cdot 3.5SiO_2$), behave on dialysis and in diffusion tests as true colloidal solutions, practically no separation of silica and soda taking place in either test. On mixing such solutions with precipitated calcium carbonate and exposing the mixture in thin layers to the air a rapid loss in weight occurs during the first few days due to evaporation of water, but subsequent loss is slight and the total loss is always 46.6% calculated on the weight of silicate solution. The first apparent action is the formation of a gel, followed after prolonged keeping by the appearance of small needle-shaped crystals of hydrated sodium metasilicate. Even after the lapse of a year no appreciable change takes place in the calcium carbonate particles. After a short period of exposure, addition of water regenerates the original colloidal solution, but after longer periods an irreversible gel is formed. In the presence of carbon dioxide the separation of the gel is accelerated. From these results the mechanism of the silicification of calcareous building stones after treatment with sodium silicate is explained as follows: The solution dries on the surface with the formation of a film of gel which slowly becomes irreversible, while crystals of hydrated sodium metasilicate form in the interior. The outer layers are slowly decomposed by the carbon dioxide of the air with the deposition of amorphous silica, the sodium carbonate simultaneously formed being washed away by rain. The solution which has penetrated into the pores of the stone is slowly decomposed by the impurities present, calcium carbonate itself being inert, and insoluble double silicates are thus formed in the pores, thereby strengthening the resistance of the stone to further atmospheric denudation.—*Chimie et Industrie* (1927), **18**, 564-585.

Calcining Cement and Lime in a Shaft Kiln. The finely divided material, alone or mixed with coal dust, is charged tangentially through tubular opening into the upper part of a shaft furnace in which it is brought in contact with a counter-current of hot gases. *German Patent No.* 445,014.

Colored Cement or Cement Mixtures. The components of cement plaster, gypsum, etc., are ground together with coloring matter in a mill adapted to reduce them to an extremely fine state, the fine particles being drawn off by air-flotation under a vacuum. Sodium silicate or other waterproofing powder is added. *British Patent No.* 280,813.

Treatment of Hydraulic Cement. The setting time and hardness of the product are regulated by adding rare earths, a compound of an element of the fourth group of the periodic system, *e.g.*, 0.3% of titanic oxide, and, if desired, other material, such as calcium sulphate, to lime or cement. *French Patent No.* 619,346.

Waterproofing Cement Products. Cement products are treated with a composition of 1 part by weight of boiled shellac dissolved in alcohol, acetic acid or caustic alkali and 8 parts by weight of alum boiled with water to a thick liquid, the ingredients being mixed to form a thin paste, and sufficient water is added to carry the mixture into the pores of the concrete. *British Patent No.* 281,022.

Influence of Carbonic Acid on Setting Rate of Portland Cement. Development of flash set probably caused by its absorption of CO_2. Portland cement containing 1.4% SO_3 remains slow setting after absorption of CO_2 gas. Maximum absorption of CO_2 is about 2% of the cement. *Jour. Jap. Ceram. Ass.* (1926) **34**, 291-292, and *Ceramic Abstracts* (1928), **3**, 137.

Reducing Water Content of Cement Slurries. The effect of adding varying amounts of sodium carbonate up to 40% of the raw cement mixture of portland cement slurries containing 30-35% of water on their viscosity has been determined with the result that the maximum fluidities are given with about 3% alkali regardless of the water content. *Jour. Jap. Ceram. Ass.*, **35**, 409, and *Ceramic Abstracts* (1928), **3**, 138.

Steam-Slaked Lime. Influence of temperature and vapor pressure in the manufacture of slaked lime on the chemical activity of the product has been experimented. Conclusions are: (*a*) The rate of hydration is accelerated by increasing vapor pressure; (*b*) it tends to fall with rise of the temperature provided that the vapor pressure remains constant; (*c*) the chemical activity of slaked lime prepared by natural hydration or hydrated at temperatures below 30 deg. C. is greater when the vapor pressure has been lower; (*d*) slaked lime which is as active as the best one prepared by natural hydration can be quickly obtained by hydrating lime with vapor at a temperature of 45 deg. C. and up. *Jour. Jap. Ceram. Ass.*, **35**, 411, and *Ceramic Abstracts* (1928) **3**, 138.

New Accelerated Test for Soundness of Portland Cement. A quick test for the constancy of volume of portland cement is as follows: A paste of normal consistency is molded into Le Chatelier's caliper. It is placed between a plate and a cover of glass and is allowed to remain for 2 hr. at 15-25 deg. C. Then it is put in an air bath and kept at 35-40 deg. C. for 4 hr., and heated in boiling water for 20 min. To pass the test satisfactorily, the expansion should not exceed 3 mm. *Jour. Jap. Ceram. Ass.*, **35**, 411, and *Ceramic Abstracts* (1928), **3**, 138.

Effect of Calcium Chloride on Some Physical Properties of Portland Cement. The effect of calcium chloride on the time of setting and strength of portland cement has been investigated. Conclusion: (*a*) Calcium chloride when used within certain limited proportions accelerates the setting and hardening of the cement and increases the tensile strength of the neat or sanded cement. *Sendai (Japan) Tech. School, Research Reports* (1926) **4**, 1-9, and *Ceramic Abstracts* (1928), **3**, 138.

Thermal Analysis of Portland Cement. The changes in weights of portland cement, its raw materials, and its products of hardening in heating have been observed with a thermobalance. (1) *Limestone.* The decomposition of the mineral commences at 600 deg. C., becomes vigorous at 690 deg. and ends at 700 deg. (2) *Clay.* (3) *Clay slate.* (4) *Gypsum.* A sudden change in weight takes place at 104 deg. The loss is completed at 660 deg. (5) *Portland cement.* (6) *Hardened cement.* The weight change takes place in three stages. The first change, occurring at about 100 deg., is due to expulsion of mechanical water, while the others, taking place at about 400 and 600 deg., are due to the decomposition of hydroxide and carbonate of calcium respectively. *Sendai (Japan) Tech. School, Research Reports*, **5**, 1-16, and *Ceramic Abstracts* (1928), **3**, 138.

Portland Cement Output in February

Production Is 19% Greater and Shipments 3% Less Than in February, 1927—Stocks Still High

THE portland cement industry in February, 1928, produced 8,785,000 bbl., shipped 6,559,000 bbl. from the mills, and had in stock at the end of the month 27,339,000 bbl., according to the United States Bureau of Mines, Department of Commerce. The production of portland cement for February, 1928, was 19% greater and shipments about 3% less than in February, 1927. Portland cement stocks at the mills were 16% higher than a year ago.

The statistics here presented are compiled from reports for February from all manufacturing plants except two, for which estimates have been included in lieu of actual returns.

The output of finished cement by the 155 plants active during February, 1928, was equivalent to 47.5% of the estimated capacity, as compared to an output of 44.6% of capacity of the 141 plants active in February, 1927. Similar comparisons for other periods are given below:

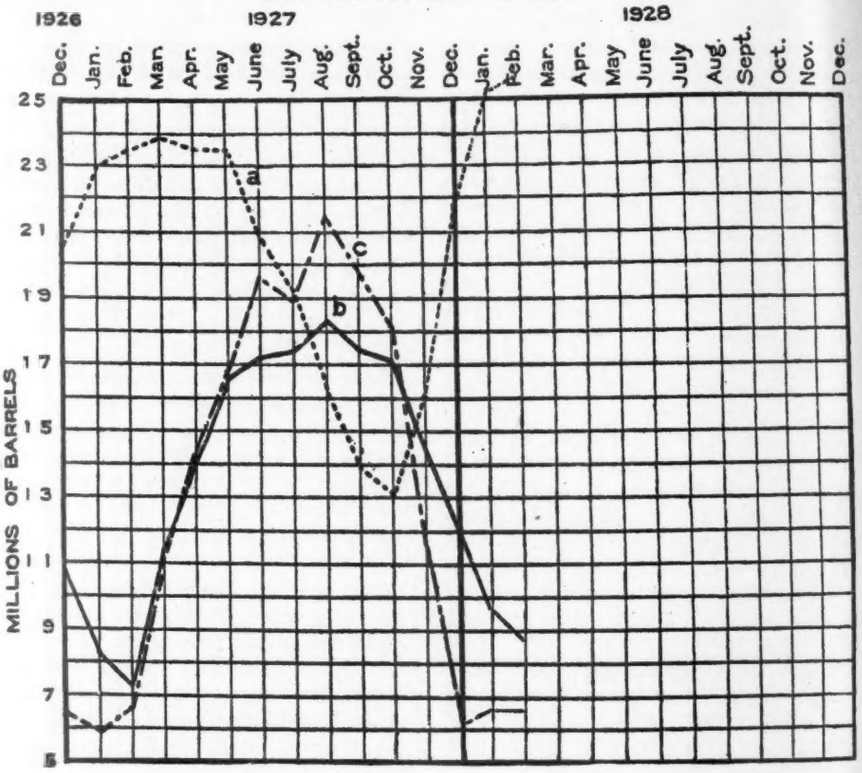
RELATION OF PRODUCTION TO CAPACITY

	Feb. 1928	Feb. 1927	Jan. 1928	Dec. 1927	Nov. 1927
	Pct.	Pct.	Pct.	Pct.	Pct.
The month	47.5	44.6	49.4	60.7	75.9
12 mo. ended—	75.1	76.2	74.5	76.2	73.7

Distribution of Cement

The following figures show shipments from portland cement mills distributed among states to which cement was shipped during December, 1926 and 1927, and January, 1927 and 1928:

MONTHLY FLUCTUATION IN PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT



(a) Stocks of finished portland cement at factories; (b) Production of finished portland cement; (c) Shipments of finished portland cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES, IN DECEMBER, 1926 AND 1927, AND JANUARY, 1927 AND 1928 (BARRELS*)

Shipped to—	1926—Dec.—	1927	1927—Jan.—	1928
Alabama	117,426	155,046	132,569	235,233
Alaska	297	132	0	396
Arizona	39,536	59,434	54,088	82,184
Arkansas	42,245	57,179	46,014	62,143
California	901,526	826,042	998,230	1,030,965
Colorado	31,711	26,653	28,050	32,389
Connecticut	52,141	86,678	34,587	74,600
Delaware	6,528	11,949	11,170	13,077
District of Columbia	64,457	35,784	50,552	30,341
Florida	317,402	113,512	283,031	108,750
Georgia	110,139	82,539	119,770	113,857
Hawaii	25,732	15,410	22,491	20,290
Idaho	13,199	4,450	15,085	6,408
Illinois	446,515	355,233	301,829	354,763
Indiana	108,771	95,953	74,589	88,411
Iowa	37,153	23,998	38,157	30,488
Kansas	88,010	54,317	68,122	78,460
Kentucky	62,172	54,834	42,851	54,991
Louisiana	89,843	87,947	116,633	94,929
Maine	6,255	10,829	6,295	12,487
Maryland	135,181	79,514	135,015	87,650
Massachusetts	72,231	116,135	70,354	104,382
Michigan	292,167	288,891	258,848	267,206
Minnesota	40,916	31,387	41,396	50,480
Mississippi	60,858	54,701	51,325	57,528
Missouri	152,647	122,565	113,581	146,411
Montana	6,455	7,373	7,261	8,289
Nebraska	26,933	22,308	22,675	26,815
Nevada	3,150	7,165	2,724	3,293
New Hampshire	18,340	17,710	16,172	17,647
New Jersey	255,744	335,550	227,489	318,204
New Mexico	13,639	8,574	12,503	12,861
New York	788,046	974,050	†700,414	800,428
North Carolina	183,912	112,931	141,582	135,292
North Dakota	2,439	1,506	3,575	2,102
Ohio	312,336	265,784	226,786	265,048
Oklahoma	120,560	166,633	164,266	201,422
Oregon	47,637	51,119	35,715	37,133
Pennsylvania	469,376	483,869	†365,107	441,419
Porto Rico	13,250	0	2,550	0
Rhode Island	19,813	23,079	19,352	25,325
South Carolina	31,523	76,157	42,537	102,178
South Dakota	3,625	1,573	5,094	5,988
Tennessee	82,556	96,493	86,485	88,966
Texas	303,770	320,825	362,004	405,245
Utah	12,944	13,669	13,356	9,575
Vermont	3,844	12,700	5,606	11,363
Virginia	61,351	76,872	62,199	91,941
Washington	90,856	95,166	104,608	90,604
West Virginia	63,680	42,219	47,871	39,992
Wisconsin	95,776	89,820	76,148	74,881
Wyoming	7,430	7,691	5,972	5,262
Unspecified	396	14,566	†19,886	12,918
	6,354,439	6,176,514	5,894,569	6,473,010
Foreign countries	77,561	49,486	73,431	47,990
Total shipped from cement plants	6,432,000	6,226,000	5,968,000	6,521,000

*Includes estimated distribution of shipments from three plants in December and January, 1927, and January, 1928, and from five plants in December, 1926.
†Revised.

PRODUCTION AND STOCKS OF CLINKER, BY MONTHS, IN 1927 AND 1928, IN BARRELS

Month	Production 1927	Production 1928	Stocks end of month 1927	Stocks end of month 1928
January	10,410,000	*11,858,000	9,989,000	*9,629,000
February	9,253,000	11,363,000	11,943,000	12,232,000
March	12,397,000	.....	12,997,000	.....
April	14,246,000	.....	13,335,000	.....
May	15,677,000	.....	12,514,000	.....
June	15,437,000	.....	10,926,000	.....
July	15,697,000	.....	9,609,000	.....
August	16,396,000	.....	7,887,000	.....
September	15,931,000	.....	6,490,000	.....
October	16,469,000	.....	5,960,000	.....
November	14,698,000	.....	6,374,000	.....
December	13,177,000	.....	7,599,000	.....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN FEBRUARY, 1927 AND 1928, AND STOCKS IN JANUARY, 1928, IN BARRELS

District	Production 1927—Feb.—	1928	Shipments 1927—Feb.—	1928	Stocks at end of February 1927	1928	Stocks at end of Jan. 1928*
Eastern Penn., N. J. & Md.	2,353,000	2,135,000	1,708,000	1,455,000	5,761,000	6,566,000	5,886,000
New York	229,000	305,000	215,000	288,000	1,453,000	1,778,000	1,761,000
Ohio, West'n Penn. & W. Va.	865,000	978,000	543,000	487,000	2,942,000	3,393,000	2,903,000
Michigan	263,000	291,000	334,000	316,000	2,019,000	2,194,000	2,218,000
Wis., Ill., Ind. & Ky.	450,000	901,000	652,000	578,000	3,239,000	3,732,000	3,409,000
Va., Tenn., Ala., Ga., Fla., La.	1,020,000	1,037,000	992,000	922,000	1,197,000	1,967,000	1,851,000
East'n Mo., Iowa, Minn., S.D.	404,000	747,000	362,000	319,000	3,241,000	3,955,000	3,527,000
West'n Mo., Neb., Kan., Okla.	236,000	487,000	527,000	495,000	1,556,000	1,647,000	1,655,000
Texas	396,000	460,000	382,000	423,000	475,000	460,000	423,000
Colo., Mont. & Utah	65,000	108,000	101,000	85,000	482,000	496,000	473,000
California	888,000	1,164,000	736,000	1,016,000	707,000	764,000	616,000
Oregon and Washington	208,000	172,000	179,000	175,000	491,000	387,000	391,000
	7,377,000	8,785,000	6,731,000	6,559,000	23,563,000	27,339,000	25,113,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1927 AND 1928, IN BARRELS

	Production 1927	1928	Shipments 1927	1928	Stocks at end of month 1927	1928
January	8,258,000	*9,766,000	5,968,000	*6,540,000	22,914,000	*25,175,000
February	7,377,000	8,785,000	6,731,000	6,559,000	*23,563,000	27,339,000
March	*11,450,000	.....	*11,100,000	.....	23,922,000	.....
April	14,048,000	.....	14,350,000	.....	23,654,000	.....
May	16,701,000	.....	16,865,000	.....	23,503,000	.....
June	17,224,000	.....	19,761,000	.....	20,972,000	.....
July	17,408,000	.....	18,984,000	.....	19,397,000	.....
August	18,315,000	.....	21,411,000	.....	16,292,000	.....
September	17,505,000	.....	19,828,000	.....	13,996,000	.....
October	17,174,000	.....	18,105,000	.....	13,141,000	.....
November	14,449,000	.....	11,619,000	.....	*16,022,000	.....
December	11,999,000	.....	6,200,000	.....	21,821,000	.....
	171,908,000	.....	170,922,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN FEBRUARY, 1927 AND 1928, IN BARRELS

District	1927—Production—1928		Stocks at end of month 1927	1928
Eastern Penn., New Jersey and Maryland	2,745,000	2,613,000	1,695,000	1,644,000
New York	297,000	552,000	538,000	854,000
Ohio, Western Pennsylvania and West Virginia	719,000	1,156,000	1,663,000	1,607,000
Michigan	716,000	664,000	1,409,000	1,525,000
Wisconsin, Illinois, Indiana and Kentucky	1,073,000	1,787,000	1,635,000	1,727,000
Virginia, Tenn., Ala., Ga., Fla. and La.	1,068,000	1,140,000	787,000	1,025,000
Eastern Missouri, Iowa, Minnesota, South Dakota	567,000	1,005,000	843,000	866,000
Western Missouri, Nebraska, Kansas, Oklahoma	284,000	621,000	722,000	535,000
Texas	395,000	455,000	134,000	142,000
Colorado, Montana and Utah	168,000	136,000	810,000	385,000
California	945,000	1,004,000	1,175,000	1,392,000
Oregon and Washington	276,000	230,000	532,000	530,000
	9,253,000	11,363,000	11,943,000	12,232,000

EXPORTS AND IMPORTS

(Compiled from the records of the Bureau of Foreign and Domestic Commerce. Figures for 1928 subject to revision)

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN JANUARY, 1928

Exported to	Barrels	Value
Canada	2,910	$10,377
Central America	5,432	13,904
Cuba	6,718	17,659
Other West Indies and Bermuda	3,464	8,834
Mexico	5,087	16,643
South America	27,804	108,420
Other countries	4,985	29,038
	56,400	$204,875

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN JANUARY, 1928

Imported from	District into which imported	Barrels	Value
Belgium	Florida	23,008	$31,755
	Galveston	6,000	9,762
	Massachusetts	27,685	42,041
	North Carolina	1	5
	Porto Rico	200	250
	Sabine	3,000	5,700
	South Carolina	95,597	128,546
	Total	155,491	$218,059
Canada	Me. & N. H.	242	$505
	St. Lawrence	1,010	1,954
	Vermont	160	209
	Total	1,412	$2,668
Denmark	Oregon	3,000	$3,205
	Porto Rico	37,230	47,230
	Total	40,230	$50,435
France	New Orleans	119	$131
Germany	New York	7	$18
Italy	South Carolina	30,000	$62,180
Japan	Oregon	2,000	$2,469
United K'd'm.	New York	4,999	$6,229
	Philadelphia	495	608
	Total	5,494	$6,837
	Grand total	234,753	$342,797

Monolith Portland Extends Field to Hawaiian Market

STIMULATION and extension of its market in the Hawaiian territory has been announced by the Monolith Portland Cement Co. of Los Angeles through an announcement of C. A. Low, vice-president and general manager of the company. Capt. A. Bullock Webster, special representative of the Monolith interests, left Los Angeles recently for Honolulu, where he will make his headquarters for several months to direct the program of promotion and distribution of Monolith products in that territory. According to the Monolith company, a survey of the Hawaiian situation disclosed the fact that cement plaster and concrete are considered almost indispensable materials for all types of construction as they withhold inroads of weather and are proof against attacks of termites or white ants and the dry rot which so rapidly deteriorate exposed wood structures in that climate.—*Denver* (Colo.) *News.*

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN JANUARY, 1928

	Barrels	Value
Alaska	155	$ 478
Hawaii	9,417	22,405
Porto Rico	4,100	9,215
	13,672	$32,098

Asano Portland Obtains Control of Japan Cement Co.

AN agreement between the Asano Portland Cement Co., of Japan, and the Japan Cement Co., has been consummated, which virtually places the latter company under the control of the Asano interests. In return for financial assistance from the Asano company, the Japan company has placed four of the Asano directors on its own board of directors, which practically means that it is being managed exclusively by the other company. According to the terms of the agreement, the Asano company is to loan the Japan company approximately $250,000, which will be increased if necessary, and will receive in return mortgages on the Saegi and Yatsushiro mills. The sales of the Japan company will also be taken over by the Asano interests under the new agreement.

Iowa Lime Rock Corp. Incorporated at Oskaloosa, Iowa

A NEW company to quarry and crush rock in the limestone region around Oskaloosa, Iowa, and in Mahaska county has been recently incorporated for $50,000. The firm is the Iowa Lime Rock Corp. of Oskaloosa, and H. W. Harding, Oskaloosa, is president and general manager. D. M. Harding of the same city is vice-president, and A. G. Harding is secretary and treasurer. These three constitute the board of directors. Machinery has been purchased and will be on hand soon for the first installation of the company's new plant which is expected to be in operation some time this spring. The business is established to crush rock for construction and farm uses and marks the first real serious attempt to reopen limestone quarries of early Mahaska county days. New deposits are said to be under lease, too, and will be quarried by the new concern.—*Oskaloosa* (Iowa) *Herald.*

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1927 AND 1928

Month	Exports 1927 Barrels	1927 Value	1928 Barrels	1928 Value	Imports 1927 Barrels	1927 Value	1928 Barrels	1928 Value
January	75,346	$254,072	56,400	$204,875	193,175	$269,661	234,753	$342,797
February	71,404	233,985	.....	.....	130,421	200,680	.....	.....
March	67,956	240,165	.....	.....	181,145	261,519	.....	.....
April	72,383	243,832	.....	.....	191,868	313,262	.....	.....
May	59,332	205,574	.....	.....	178,929	263,618	.....	.....
June	69,205	237,281	.....	.....	129,111	201,682	.....	.....
July	72,337	229,737	.....	.....	175,035	249,665	.....	.....
August	61,371	209,198	.....	.....	117,605	170,167	.....	.....
September	57,888	207,817	.....	.....	233,066	297,716	.....	.....
October	67,639	230,668	.....	.....	221,274	321,777	.....	.....
November	79,869	257,476	.....	.....	141,485	190,419	.....	.....
December	62,099	226,960	.....	.....	156,609	209,205	.....	.....
	816,829	$2,776,765	.....	.....	2,049,723	$2,949,371	.....	.....

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Lime-Stone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Feb. 11	Limestone Flux Week ended Feb. 18	Sand, Stone and Gravel Week ended Feb. 11	Sand, Stone and Gravel Week ended Feb. 18
Eastern	1,896	1,846	1,511	1,604
Allegheny	2,890	2,720	2,095	2,456
Pocahontas	192	202	617	514
Southern	558	494	8,592	8,258
Northwestern	458	732	2,069	2,031
Central western	372	339	5,388	5,547
Southwestern	320	402	4,202	4,255
Total	6,686	6,735	24,474	24,665

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1927 AND 1928

District	Limestone Flux 1927 Period to Date Feb. 19	Limestone Flux 1928 Period to Date Feb. 18	Sand, Gravel and Stone 1927 Period to Date Feb. 19	Sand, Gravel and Stone 1928 Period to Date Feb. 18
Eastern	14.857	12,116	10.149	11,695
Allegheny	21,997	18,629	16,142	13,716
Pocahontas	954	1,454	2,619	2,878
Southern	3,290	3,532	67,894	58,520
Northwestern	5,359	3,863	13,211	9,915
Central western	2,817	2,581	32,724	35,197
Southwestern	1,763	2,776	25,567	28,498
Total	51,037	44,951	168,306	160,419

COMPARATIVE TOTAL LOADINGS 1927 AND 1928

	1927	1928
Limestone flux	*51,037*	*44,951*
Sand, stone, gravel	*168,306*	*160,419*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning March 10:

CENTRAL FREIGHT ASSOCIATION DOCKET

17653. To establish on **sand and gravel**, carloads, Lafayette, Ind., to Swygert, Ill., rate of $1.26 per net ton. Present rate, sixth class.

17656. **Lime, agricultural and fluxing**, having no commercial value for chemical or building purposes, carloads, from Durbin, Ohio, to Alton, Federal, and South Wood River, Ill., rate of 14c; minimum weight 30,000 lb. Present rate, lime, agricultural and fluxing, from Durbin, Ohio, 14½c, per Erie R. R. Tariff I. C. C. No. A6816.

17657. To establish the following rates on **crushed stone**, carloads, from Chicago, Ill., and points taking same rates in C. F. A. T. B. Tariff 197 series, to Pennsylvania R. R. stations in Indiana, viz. (rates in cents per net ton):

To	Pres.	Prop.	To	Pres.	Prop.
Auburn	120	125	Huntertown	125	125
Auburn Jct.	120	125	Wallen	125	125
Cedar	120	125	Ft. Wayne	125	125
La Otto	120	125			

To B. & O. stations in Indiana, viz. (rates in cents per net ton):

To	Pres.	Prop.	To	Pres.	Prop.
Napanee	*138	120	Albion	*138	120
Milford Jct.	*138	120	Avilla	138	125
Syracuse	*138	120	Garrett	138	125
Wawasee	*138	120	Auburn	138	125
Cromwell	*138	120	St. Joe	138	125
Kimmell	*138	120			

*From McCook and Thornton, Ill., via B. & O. C. T., rate is $1.13.

17669. To establish on **crushed stone**, carloads, Findlay, Sandusky and Marblehead, Ohio, to Detroit, Mich., rate of 95c per net ton. Present rates, from Findlay 105c per net ton, from Sandusky 196c per net ton, and from Marblehead sixth class.

17650. To establish on **sand** (except blast, core, engine, filter or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads, Wolcottville, Ind., to Delta, Ohio, rate of 76c per net ton. Route, Wabash Ry. direct. Present rate, 88c per net ton.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

17718. To establish on **ground and agricultural limestone**, carloads, Marblehead, Ohio, to Olean, N. Y., rate of $3.02 per net ton. Present rate—20½c on ground limestone and classification basis on agricultural limestone.

17720. To establish on **crushed stone and crushed stone screenings**, in bulk in open cars, carloads, Marblehead, Ohio, to points in Michigan rates as shown in Exhibit A attached. Present rates—As shown in Exhibit A attached.

To	Pres. Rate	Pro. Rate	To	Pres. Rate	Pro. Rate
Ann Arbor	127	115	Kalamazoo	184	132
Adrian	127	102	Lakeland	138	120
Albian	161	122	Lapeer	173	127
Alma	184	145	Lansing	173	127
Ashley	173	140	Lowell	196	150
Battle Creek	173	127	Manchester	127	107
Bay City	196	137	Marshall	127	107
Caro	196	137	Monroe	127	107
Cassopolis	184	137	Muskegon	242	160
Charlotte	173	127	Napoleon	138	112
Clifford	184	145	Niles	184	137
Dundee	115	110	Owosso	173	130
Durand	161	130	Oxford	161	122
Eaton Rapids	161	122	Plymouth	138	120
Edmore	207	150	Pontiac	161	122
Flint	173	135	Port Huron	173	135
Fraser	...	125	Richmond	161	125
Grand Haven	242	160	Rives Jct.	161	117
Grand Rapids	196	137	Romulus	127	115
Hartford	253	165	St. Johns	173	140
Hastings	184	132	Saginaw	184	137
Hillsdale	138	112	Sandusky	242	165
Holland	219	155	Schoolcraft	184	137
Holly	161	130	Sheridan	196	150
Howard City	207	155	Sparta	207	155
Howell	138	125	Sturgis	173	127
Hudson	127	107	Tecumseh	127	102
Ionia	196	145	Three Rivers	184	132
Jackson	138	117	Wayne	127	115
Jonesville	138	117	Woodbury	173	140

Present and proposed rates in cents ner pet ton.

17722. To establish on **crushed stone**, carloads, Milltown and Marengo, Ind., to Dillsboro, Ind., rate of 110c per net ton. Present—Sixth class.

17723. To establish on **crushed stone, stone screenings and agricultural limestone** (not ground or pulverized), in bulk, carloads, from Milltown and Marengo, Ind., to Rogers, Blackburn, Petersburg, Gletzen, Little, Massey, Cudgel, Somerville, Mackey, Buckskin, Rosebud, Elberfeld, Daylight and Iglehart, Ind., rate of 103c per net ton. Present rate, 105c to 110c per net ton.

17730. To establish on **crushed stone, crushed stone screenings, tailings and agricultural limestone** (other than ground or pulverized agricultural limestone, ground or pulverized limestone, fluxing stone or raw dolomite, firestone and silica rock or silica stone) in bulk, carloads (See Note 1), except when car is loaded to full visible capacity, actual weight will apply, Bedford, Coxton, Heltonville and Oolitic, Ind., to Evansville, McCutcheon, Iglehart, Daylight, Elliot, Elberfield and Rosebud, Ind., located on the E. I. & T. H. Ry., rate of $1.03 per net ton, Indiana intrastate traffic only. Present rate, $1.05 per net ton.

17785. To establish on **fluxing stone** in bulk in open-ton cars, carloads, Marblehead, Ohio, to Barberton, Ohio, rate of 100c per gross ton. Present rate—113c per gross ton.

17803. To establish on **crushed stone**, in bulk, carloads, Osgood, Ind., to Moores Hill and Dillsboro, Ind., rate of 65c per net ton. Present rates, 80c per net ton to Moores Hill, Ind.

17806. To establish on **sand and gravel**, carloads, Buck Hill, Ohio, to Salem, Ohio, rate of 75c per net ton. Present rate, 80c per net ton.

17808. To establish on **crushed stone**, in bulk in open-top cars only, carloads, Chicago, Ill., and points taking same rates to Vineland and Hickory Creek, Mich., rate of 101c per net ton. Present rate, 115c per net ton.

17809. To establish on **crushed stone**, in bulk in open-top cars, carloads, Woodville, Ohio, to Ohio, following rates:

To—	Pro.	Pres.	To—	Pro.	Pres.
Leavittsburg	145	3.90	Doughton	165	3.90
Hubbard	175	3.90	Phalanx	145	3.90
Phalanx	155	3.90	Dillonvale	155	4.00
N. Randall	165	3.30	Bradley	165	4.00
Orangeville	155	3.90	Beach City	125	3.40
Mineral Ridge	155	3.90	Ulrichsville	135	3.60
Lisbon	150	3.90	Tippecanoe	145	3.60
Mentor	125	3.40	Piedmont	150	4.00
Saybrook	135	3.70	Fairport Har.	165	3.40
Conneaut	145	3.90	Adena	155	4.00
Dorset	145	3.90	Dillonvale	155	4.00
Andover	145	4.00	Warrenton	165	4.00
Fowler	160	3.90	Neffs	165	4.10

17811. (a) To revise **rates on sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel**, carloads from following points in Pennsylvania: Beaver, Belmar, Bosswell, Brandon, Cabot, Cheswick, Coverts, Creighton, Derry, Dunbar, East Brady, East Sandy, Echo, Edenburg, Eastbrook, Ellwood Junction, Emlenton, Erie, Ford City, Foxburg, Freeport, Greenville, Hadley, Harwick, Henlein, Hillsville, Hunker, Jackson Centre, Jamestown, Johnstown, Kennerdell, Leesburg, Manorville, McKees Rocks, Murdock, Oil City, Pulaski, Reesedale, River Valley, Rochester, Rowena, Schollard, Siverly, South Oil City, Star Brick, Two Lick, Vanport, Venango, Volant, W. Ellwood Junction, W. Hickory, W. Middlesex, W. Pittsburgh, W. Winfield, Woodlawn.

To destinations in the state of Pennsylvania within the following boundaries for distances not exceeding 200 miles: Beginning at Bulls Mill, thence through Port Allegany, Coudersport, Germania, Jersey Mills, Williamsport, Allens, Glen Iron, Raubs Mills, Duward, Port Royal to Pennsylvania-Maryland state line.

To reflect basis set forth in paragraph (c) herein. (b) to revise the rates on crushed stone and stone screenings, including crushed limestone and limestone screenings, carloads, from following points in Pennsylvania: Annandale, Atlantic (Somerset Co.), Branchton, Casparis, Chewton, Connellsville (Bluestone Co.), Dunbar, Echo, Eastbrook, Ellwood Junction, Ellwood City, Fetterman, Gray (Westmoreland Co.), Harrisville, Hillside, Johnstown, Kittanning, Latrobe, Mostoller, Neshannock Falls, New Castle, Packsaddle, Reading Junction, Redmond, Robinson, Rock Point, Rumbaugh, Two Lick, Wampum, West Pittsburgh, Whitney, Wick, Worthington.

To destinations in the state of Pennsylvania within the following boundaries for distances not exceeding 200 miles: West of a line drawn from sand patch on the B. & O. R. R. to Cresson on the P. R. R., thence due north to the Pennsylvania-New York state line.

To reflect the basis set forth in paragraph (c) below. (c) Rates on sand and gravel, also crushed

stone and stone screenings, etc., as described hereinabove from and to the territories involved are to be revised to the following mileage scale basis:

	Rates are in cents per 2000 lb. For Single line hauls	For joint line hauls
20 miles and under	60	80
40 miles and over 20	70	90
60 miles and over 40	80	100
80 miles and over 60	90	110
100 miles and over 80	100	120
125 miles and over 100	110	130
150 miles and over 125	120	140
175 miles and over 150	130	150
200 miles and over 175	140	160

(d) To cancel all commodity rates on ballast, carloads, published by the Baltimore and Ohio R. R., Bessemer and Lake Erie R. R., Buffalo, Rochester and Pittsburgh Ry., Erie R. R., New York Central R. R., Pennsylvania R. R., Pittsburgh and Lake Erie R. R. and Pittsburgh and Shawmut R. R., which apply on Pennsylvania state traffic because said commodity rates are higher than the crushed stone rates. (e) Revision mentioned hereinabove is to affect only Pennsylvania state rates.

17813. To establish on **sand and gravel**, carloads, Phalanx, Ohio, to Neffs, Ohio, rate of $1.40 per net ton. Present rate, 16½c.

17814. To establish on **crushed stone**, carloads, Monon, Ind., to Yoeman and Pattons, Ind., rate of 65c per net ton. Present rate, 70c per net ton.

17815. To establish on **sand, viz., blast, core, engine, foundry, glass, molding or silica**, carloads, Cincinnati and Delhi, Ohio, to Richmond, Ind., rate of $1.65 per net ton. Present rate, $1.89 per net ton.

17819. To establish on **molding sand**, carloads, Rockport, Ind., and points on E. & O. V. and Southern Rys. taking same rates to Benton, Ill., rate of $2.02 per net ton. Present rate, sixth class.

SOUTHERN FREIGHT ASSOCIATION DOCKET

38599. **Marble, ground or pulverized**, from Tate, Ga., to Chattanooga, Tenn., and Birmingham, Ala. Eighth class rates now apply. Proposed rates on—**Marble ground or pulverized**, in bags, carloads (See Note 1), from Tate, Ga.: To Birmingham, Ala., 220c per net ton, same as current rate on powdered whitestone from Whitestone, Ga., to Birmingham; to Chattanooga, Tenn., 176c per net ton, made on basis of the proposed Georgia-Alabama limestone scale, less 10%.

38681. **Limestone**, from Fairmount, Bolivar and Whitestone, Ga., to Savannah, Ga. It is proposed to revise the present rate of 198c per net ton on—Limestone, ground, powdered or pulverized, slate, ground, crushed, powdered or pulverized, carloads, minimum weight as per Item 445 of L. & N. R. R. I. C. C. A15710, from Fairmount, Bolivar and Whitestone, Ga., to Savannah, Ga., applicable on interstate traffic, to be 210c per net ton, or the same as the current rate applicable on intrastate traffic.

38739. **Crushed and rubble stone or granite sand** from Conyers, Lithonia, Redan and Stone Mountain, Ga., to Philadelphia, Penn., etc. It is proposed to establish reduced rate of 435c per net ton on stone, viz.: Crushed, rubble or granite sand, carloads, minimum weight 60,000 lb.—from the origins named to Philadelphia, Penn., and points taking same rates as per Note 27, page 6, and points named on pages 17, 18 and 19 of Georgia R. R. Stone Tariff 1292E, arrived at by using as a factor south of Richmond, Va., the rates prescribed by the commission in Docket 17517, to which is added the specific of 210c beyond.

38740. **Sand**, from Leedy, Miss., to Gadsden, Ala., and Columbus, Ga. Combination now applies. Proposed rates on sand, carloads (See Note 3), from Leedy, Miss.: To Gadsden, Ga., 180c; to Columbus, Ga., 175c per net ton—made by use of the scale prescribed by the commission in Docket No. 17517.

38759. **Limestone**, etc., from Whitestone, Ga., to Dothan, Ala. Combination now applies. Proposed rate on **limestone, whitestone or marble, ground, powdered or pulverized**, carloads (See Note 2), from Whitestone, Ga., to Dothan, Ala., 230c per net ton, made on basis generally used in establishing rates on this commodity between southern points.

38800. **Limestone**, from Calera, Ala., to Mobile, Ala., for export. It is proposed to establish rate of 162c per 100 lb. on **limestone, ground or pulverized**, as described in So. Ry. I. C. C. A10132, carloads, from Calera, Ala., to Mobile, Ala., for export to all foreign countries, same as rate recently authorized for application to Mobile for export to Cuba.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

13986. **Stone, broken or crushed**, in bulk, in gondola or other open-top cars, carloads (See Note 2), from Rocky Hill and East Wallingford, Conn., to stations on Central Vermont Ry., West Hartford, Vt., to St. Albans, Vt., inclusive, to West Hartford, $1.90 per net ton; to other points, $1.95 per net ton. Reason—To provide rates comparable with rates in effect from other points.

13994. **Stone, broken or crushed**, carloads (See Note 2), in open cars, from Branford (Pine Orchard Quarry), Conn., to Danbury, Conn., $1 per net ton. Reason—To meet competitive conditions.

14063. **Gravel and common sand**, carloads (See Note 3), from Milton, N. H., to Burlington, Vt., $1.85 per net ton, via White River Junction, Vt., and the C. V. Ry. Reason—To establish a commodity rate comparable with those now effective for similar distances.

14068. **Sand**, carloads (See Note 2), from Wickford Junction, R. I., to New Brunswick, N. J., 19½c, via Greenville Piers, N. J., P. R. R. and via Communipaw, N. J., C. R. R. of N. J., R. R. R. R. Reason—To provide rate same as that now in effect from and to more distant points.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4201, Sub. 1. **Common sand and gravel**, carloads (See Note 3), but not less than 40,000 lb., from Chillicothe, Ill., to Carbon Cliff, Silvis, East Moline and Rock Island, Ill. Rates in cents per net ton. Present, 101c; proposed, 88c.

4360. **Crushed stone and crushed slag, carloads**, from Joliet, Ill., to Isles, Curran, Alexander, Orleans, Jacksonville Junction, etc., Ill. Rates per ton. Present, $1.39; proposed, $1.26.

4369. **Stone**, carloads, minimum weight as per Illinois classification, from Alton, Ill., to I. C. R. R. stations., Springfield and south. Present—Class rates. Proposed—To stations on I. C. R. R., Litchfield and south, 91c per ton, and to stations north of Litchfield, to and including Springfield, $1.11 per ton of 2000 lb.

4374. **Stone, crushed**, carloads (See Note 3), but not less than 40,000 lb., from Moline, Ill. Rates in cents per ton:

To representative points.	Present	Proposed
Taylor Ridge, Ill.	101	88
Pre-emption, Ill.	150	88
Shale City, Ill.	101	88

3232-A. **Sand** (not molding nor silica), **and gravel**, carloads, rates per net ton, from Hannibal, Mo., to Bloomington, Ill., present, class rates; proposed, $1.26. Springfield, Ill., present, class rates; proposed, $1.13. Mason City, Ill., present, class rates; proposed, $1.26. Hamilton, Ill., present, class rates; proposed, 88c.

4379. **Sand, molding**, carloads (See Note 3), but not less than 40,000 lb., rates in cents per net ton, from Kinderhook, Ill., to Litchfield, Ill., present 250c, proposed 113c; Edwardsville, Ill., present 240c, proposed 126c; East St. Louis, Ill., present, 250c, proposed 139c; St. Louis, Mo., present 250c, proposed 139c; Belleville, Ill., present 250c, proposed 150c; Chicago, Ill., present 320c, proposed 176c.

WESTERN TRUNK LINE DOCKET

5319A reissued. Rates and minimum weights: **Sand, gravel or stone** (crushed, chip, dust, ground, rip-rap or rubble), carloads, from stations in Nebraska on the Mo. Pac. R. R. Corp. in Nebraska to points in Iowa. Present—Through class rates or combination of local commodity rates. Proposed—First, establish the Nebraska joint line mileage scale as published in W. T. L. Tariff 175, applicable on gravel, sand and stone, for distance in excess of 300 miles to and including 500 miles for two-line hauls only.

Second—Provide for the Nebrsaka joint line mileage scale as published in W. T. L. Tariff 175, applicable on gravel, sand and stone, for distances 1 to 500 miles inclusive, applicable for two-line hauls only in Section 4 of W. T. L. Tariff 18L, I. C. C. A1701.

Third—Eliminate reference circle (4) and the explanation thereof appearing in Item 4835, W. T. L. Tariff 18L, I. C. C. A1701.

Present minimum weights—Various. Proposed (See Note 3), but in no case shall the minimum weight be less than 40,000 lb.

2310F. Rate: **Sand, molding**, as described in Item 6320, W. T. L. 50N (See Note 3). In no case shall the minimum weight be less than 40,000 lb., from Aiken, Ill., to Marshalltown, Iowa. Present, 12c; proposed, 11c.

TRUNK LINE ASSOCIATION DOCKET

17918. **Stone, crushed; screenings and tailings**, carloads (See Note 2), from Worthington, Penn., to Foxburg, Penn., $1 and Brookville, Penn., $1.10 per 2000 lb. Reason: Proposed rate is based on mileage scale prescribed by Pennsylvania Public Service Commission in Docket No. 6951.

17923. **Stone, crushed; screenings and tailings**, carloads (See Note 2), from Worthington, Penn., to Colwell 90c; Brookville and Reitz, Penn., $1.10 per ton of 2000 lb. Reason: Proposed rates are based on mileage scale prescribed by the Pennsylvania Public Service Commission in Docket No. 6951.

17942. **Crushed stone and broken stone**, carloads (See Note 2), from Munns and Oriskany Falls, N. Y., to D. & H. Co. stations, Lanesboro, Penn., Windsor, Binghamton, Oneonta, Cobleskill, Hyndsville, N. Y., and various rates ranging from $1.20 to $1.40 per ton of 2000 lb. Reason: Proposed rates are comparable with rates from Little Falls, N. Y.

17945. (A) **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads; (B) **Sand, blast, engine, foundry, molding, glass, silica, quartz or silex** carloads (See Note 2), from Lewes, Del., to Newark, Del.; (A) $1.40 per ton of 2000 lb.; (B) 7½c per 100 lb. Reason: Proposed rates are comparable with rates now in force to Delaware City, New Castle and Wilmington, Del., as per P. R. R. G. O. I. C. C. 14212.

17946. **Sand and gravel**, carloads (See Note 2), from siding of the West Jersey Sand and Supply Co., located on the west bank of the Schuylkill river to east side (Philadelphia, Penn.), 50c per ton of 2000 lb. Reason: Proposed rate compares favorably with rate on like commodities between other stations in Philadelphia as per B. & O. R. R. I. C. C. 21026, P. R. R. G. I. C. C. 13959 and Rdg. Co. I. C. C. 166.

17958. To adjust the rates on sand (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) **and gravel** (See Note 2), from origins contiguous to, competitive with, those in the complaints (P. S. C. of Pennsylvania, Dockets Nos. 5855, 6951 and 7079) to destinations in the state of Pennsylvania within the following boundaries, for distances not exceeding 200 miles: Beginning at Bullis Mill, thence through Port Allegany, Coudersport, Germania, Jersey Mills, Williamsport, Allens, Glen Iron, Raubs Mills, Duward, Port Royal to Pennsylvania-Maryland state line. Also adjust rates on **crushed stone and stone screenings**, including **crushed limestone and limestone screenings**, carloads (see Note 2), from origins, contiguous to and competitive with those in the complaint (P. S. C. of Penn., Dockets Nos. 5855, 6951 and 7079) to destinations in the state of Pennsylvania within the following boundaries, for distances not exceeding 200 miles. West of a line drawn from Sand Patch on the B. & O. R. R. to Cresson on the P. R. R., thence due north to the Pennsylvania-New York state line, on the basis of the following scale (rates in cents per 2000 lb.):

	For Single Line Hauls	For Joint Line Hauls
20 miles and under	60	80
40 miles and over 20	70	90
60 miles and over 40	80	100
80 miles and over 60	90	110
100 miles and over 80	100	120
125 miles and over 100	110	130
150 miles and over 125	120	140
175 miles and over 150	130	150
200 miles and over 175	140	160

All the rates proposed are to apply only for Pennsylvania intrastate movement. Reason—To place the rates from all points on a comparable basis.

17848 (Sup. 1)—**Sand, molding**, carloads (See Note 2), from Hutchins and Ridgway, Penn., to Detroit, Mich., $2.40 per ton of 2000 lb.

17966. **Limestone, ground, precipitated or pulverized, and limestone dust**, carloads, minimum weight 50,000 lb., from Atlas, Hamburg and Lime Crest, N. J., to B. & M. R. R. points, Bellows Falls, Brattleboro, Vt., Concord, Epping, N. H., Greenfield, Ipswich, Mass., Keene, N. H., Lawrence, Mass., Manchester, Portland, Portsmouth, N. H., and Woburn, Mass., 19½c per 100 lb. Reason—Proposed rates are comparable with rates now in force to points on the B. & A. R. R. as per L. & H. H. Ry. I. C. C. A1789.

17968. (A) **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex; (B) **Sand, blast, engine, foundry, molding, glass, silica, quartz or silex**, carloads (See Note 2). To Chestertown, Md.: From South Jersey points—Group 1: Pasadena, Greenwich, Woodbury, Vineland, Pomona, West Collingswood, Tuckahoe, N. J., and various, (A) 220c, (B) 240c. Group 2: Mauricetown, Bivalve, Reega, Longport, Pleasantville, Terrace, Atlantic City, Stone Harbor, N. J., and various, (A) 230c, (B) 250c. Rates in cents per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force from same points of origin to Baltimore, Md., Lewes and Wilmington, Del.

17985. **Sand, viz.: Blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica**, carloads (See Note 2), from White Bridge, Penn., to Aliquippa, Monaca, Beaver, Rochester, Beaver Falls, Penn., $1.85; Steubenville, Ohio, $1.95, and Weirton, W. Va., $2.25 per ton of 2000 lb. Reason—Proposed rates are comparable with rates now in force to Monessen, Zelienople, Washington, Ellwood City, Penn., and Wheeling, W. Va.

Sand-Lime Brick Production and Shipments in February

THE following data are compiled from reports received direct from 26 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is 1 more than those furnishing statistics for the January estimate published in the February 18 issue. The statistics below may be regarded as representative of the entire industry, the reporting plants having about one-half the production capacity in the United States and Canada.

Production showed a continued decrease from the figures for January, since the spring demand has not yet developed. Seven plants reported very little or no production. Slight decreases were also shown in both truck and rail shipments, and in unfilled orders, while stocks on hand remained practically the same as the previous month. There is no appreciable change in the prices quoted by dealers over practically the whole country.

The following are average prices quoted for sand-lime brick in February:

Average Prices for January

Shipping Point	Plant Price	Delivered
Albany, Ga.	$11.00	.....
Buffalo, N. Y.	12.25	$16.50
Dayton, Ohio	12.50	15.50
Detroit, Mich.	13.50	15.50
Detroit, Mich (2 plants)	.....	15.50
Detroit, Mich.	.....	15.75
Flint, Mich.	11.50	.....
Grand Rapids, Mich.	12.50	.....
Jackson, Mich.	12.25	.....
Lakeland, Fla.	10.00	12.00
Madison, Wis.	11.00	.....
Menominee, Mich.	11.00	14.50
Michigan City, Ind.	11.00	.....
Milwaukee, Wis.	10.50	13.00
Minneapolis, Minn.	10.00	12.75
New Orleans, La.	.....	.....
Pontiac, Mich.	12.50	15.20
Rochester, N. Y.	.....	19.75
Saginaw, Mich.	12.00	.....
Sebewaing, Mich.	.....	.....
Sioux Falls, S. D.	13.00	13.00@16.00
Syracuse, N. Y.	18.00	20.00
Toronto, Canada	13.50	16.00
Winchester, Mass.	.....	16.00
Winnipeg, Canada	.....	14.00

The following statistics are compiled from data received direct from 26 producers of sand-lime brick in the United States and Canada:

Statistics for January and February, 1928

	*January	†February
Production	12,789,000	10,920,600
Shipments (rail)	4,944,500	3,737,900
Shipments (trunk)	7,024,100	6,203,500
Stock	15,867,000	16,920,200
Unfilled orders	14,830,000	12,625,000

*Revised to include two plants not furnishing January data previously, 25 plants reporting.
†Incomplete, two plants not reporting stocks, and seven not reporting unfilled orders.

News From Producers

The Jackson Brick Co. of Jackson, Mich., is furnishing brick for the new Elks Temple in Jackson, on which construction is to start immediately.

Boice Bros. of Pontiac, Mich., is to furnish brick for the new Riker building on West Huron street in Pontiac, and also for the J. R. Dalley apartments at Oak and Huron streets, Pontiac. Another contract is for furnishing brick for the Bloomfield school at Birmingham, Mich.

Schumacher Wall Board Corp. Opens News Factory

A NATIONAL distribution of the products of the Schumacher Wall Board Corp., of Los Angeles, will result from the recent opening of the corporation's new factory in Los Angeles, according to the statement of A. R. Moylan, vice-president and general manager of the concern. Mr. Moylan stated that the demand in recent months had greatly exceeded the capacity of the plant, and that with the new factory the output will be increased from 4,000,000 to 7,000,000 sq. ft. of wall board and plaster lath per month. The new unit is about 600 ft. long and cost approximately $500,000.

Distribution of the company's product in the past has been confined to states west of the Mississippi, but with the increased production new markets will be opened throughout the east. During the past year the northern division of the company, located at Seattle, consolidated with the Western Wall Board Co., forming Gypsum Products Inc., which has extensive distribution throughout the northwest.

Financing of the expansion program has been effected by the issue of 3000 shares of preferred and 6000 shares of common stock, which brings the total issued capital to 33,000 shares of preferred and 66,000 shares of common stock.—*Los Angeles* (Calif.) *Express.*

Portland Cement Terms

Editor, Rock Products:

I HAVE READ with interest your editorial on "A Confusion of Terms," published in Rock Products, January 21, 1928. As you solicit suggestions from your readers, I take the liberty of sending you some information concerning this subject, which was recently an object of discussion, when the new Belgian standard specifications for portland cement were elaborated.

The terms "quick hardening" and "early high strength" have their correspondents in French, which are "a durcissement rapide" and "a haute résistances initiales," and both are used indifferently. "Superciment" was also much used, as in German "Edelzement" and "hochwertiger Zement," but these terms generally mean high strength cement.

The new Belgian specifications distinguish three classes of portland cement, which are: (1) normal cement, for general use; (2) high strength portland cement, for works subject to greater stress, as, for instance, concrete roads; (3) quick hardening portland cement, which is adopted when the concrete is to be used soon after the completion. These three classes are defined by their minimum resistance after 7 and 28 days' curing for the first class; after 3, 7 and 28 days for the second and after 24 hours and 3, 7 and 28 days for the third, as shown by appended table.

F. VAN ORTROY, General Secretary,
CIMENTERIES ET BRIQUETERIES REUNIES,
Antwerp, Belgium

BELGIAN CEMENT SPECIFICATIONS

Type of portland cement	Test	Strength of 1:3 mortar in lb./in.² 1-day (moist air)	3-day (1 day in moist air, 2 under water)	7-day (1 day in moist air, 6 days under water)	28-day (1 day in moist air and 27 days under water)
Normal	Tensile	.....	.....	255	325
	Compression	.....	.....	2840	4250
High strength (ciment a hautes resistance)	Tensile	.....	325	355	425
	Compression	.....	4250	5675	7200
Quick hardening (ciment a durcissement rapide)	Tensile	284	355	425	460
	Compression	3200	5675	7200	7800

American Society of Mechanical Engineers Honors Prof. H. Le Chatelier

AT a ceremony in Paris on February 28, Charles M. Schwab presented a medal and a certificate of honorary membership in the American Society of Mechanical Engineers to Professor Henry le Chatelier, the French chemist. The presentation was made at a luncheon given by Ambassador Herrick in the American Embassy. The honors were conferred upon Professor Le Chatelier for his introduction of new methods of physico-chemical analysis which are now considered indispensable in all metal working establishments. This is one of the first instances of the honoring of Professor Le Chatelier by America, although he was a pioneer, and long an outstanding figure, in the study of lime, cement and gypsum. He was one of the first to do original research work on this subject.

In presenting the award, Mr. Schwab declared the French scientist one of the greatest men of his day, classing him with Thomas A. Edison. Accepting the medal and membership, Professor Le Chatelier said that the "application of common sense to industry" was a distinct contribution by the United States to the present era.

Among the luncheon guests were Marshal Foch, Count De Jean, the Brazilian ambassador, and officers of the principal scientific societies of Paris.

Appeal Case Following Appraisal of Ideal Portland Plant

FOLLOWING the appraisal of its plant at Concrete, Colo., by Ford, Bacon & Davis, New York appraisal engineers, the United States Portland Cement Co., a subsidiary of the Ideal Portland Cement Co., has appealed the case on the ground that the sale price fixed by the appraisers is not fair to the company. The sale valuation set by the appraisers was $1,550,000, but they are reported to have placed the actual physical value of the plant at $2,785,000. The appeal is scheduled to come before the U. S. District Court during March.

The controversy has lasted since 1924, when the Cement Securities Co. was dissolved by an order of the federal court. The United States company, which succeeded to the property, has repeatedly shown its willingness to comply with the court order requiring the sale, but has claimed that no equitable valuation has been set on the Concrete plant as yet. A considerable portion of the past year was spent in obtaining the present appraisal.

South Dakota State Cement Plant Loses Money

OPERATING profits for the South Dakota state cement plant for the year 1927, not counting interest on the investment, are given at $39,791.37, but as this interest on the investment still is a definite charge against the taxpayers, because of outstanding bonds issued to cover the construction costs, it clearly should be taken into account. With the annual bond interest of $102,700 included in the calculation, the cement plant shows an operating loss of $62,998.63 for the year 1927. This is $995.47 less than the loss for 1926 and less than the loss in any of the other years that the plant has been in operation. There are no immediate prospects, however, that the plant can be made to break even, to say nothing of obtaining profit returns to wipe out the investment account.—*Sioux City* (Iowa) *Tribune.*

New French Cement Mill Planned Near Bordeaux

ACCORDING to the report of Consul Memminger of the Bordeaux district, in France, a new cement plant is to be erected in that district. The report states:

"This plant, which is being constructed by the Societe des Ciments de Daignac, a company capitalized at 6,000,000 francs, is situated in the commune of Espiet (Gironde), about 33 kilometers from Bordeaux, and is on the railroad line running from Bordeaux to Eymet (Dordogne). The plant will thus have sufficient transportation facilities to ship its production to Bordeaux and through the prosperous valleys of the Garonne and the Dordogne.

"The company states that it possesses an underground limestone quarry of about 20 hectares and that there is sufficient waste material, which has resulted from the extraction of stone for building purposes in the past, to furnish the plant for several years. The estimated annual production of the plant will be 50,000 metric tons of artificial portland cement, and the company expresses the opinion that the entire production will be employed in this region, especially in view of the fact that the local plants have not been able to supply the demand and cement is imported from Belgium and northern France. Should it be necessary, the company has connections through an important French colonial company to export to the French colonies. It is reported that this plant will be equipped with the most modern machinery, in order to reduce hand labor to the minimum."

Bureau of Mines Undertakes Economic Studies of Nonmetallic Minerals

THE WORK of the Rare Metals and Non-Metals Division in the Economics Branch of the United States Bureau of Mines, Department of Commerce, is to be expanded by increasing its activities in the nonmetallic minerals. A special section having to do chiefly with the structural nonmetallics, such as stone, cement, brick and tile, sand and gravel, lime and gypsum, is being organized. Oliver Bowles, formerly supervising engineer of the Nonmetallic Minerals Experiment Station, at New Brunswick, N. J., has been placed in charge of this section with J. R. Thoenen, mining engineer of the New Brunswick station, as assistant. The work will be centered in Washington, D. C.

J. R. Thoenen

The structural nonmetallics and their primary products have a total annual production value in the United States of approximately one billion dollars, and, through their extensive use in all types of buildings,

Oliver Bowles

public works, highways and railroads, their influence touches the life of practically every community and every individual. Intensive study directed toward such business problems as systematized cost keeping, distribution of products, transportation, a better knowledge of markets, market requirements, extension of uses, and similar features that have an important bearing on the healthy prosperity of any industry, would benefit not alone the nonmetallic industries that occupy so important a place in the economic life of the country, but should be of undoubted indirect benefit to the public at large.

Ontario Graphite Mill Damaged by Fire

THE refining mill of the Black Donald Graphite Co., Ltd., 14 miles west of Calabogie, Renfrew County, Ontario, and other buildings at the mine were destroyed by fire on the night of February 28, entailing a loss estimated at $100,000. The fire did not enter the mine proper, as the mill is situated about 100 ft. from the mouth of the two main shafts.

Black Donald is the largest graphite mine in the world. It employs 200 men, who will be thrown out of work until the refining plant and boiler room are rebuilt. It is expected that this work will require several month to complete.—*Engineering and Mining Journal.*

Bausman Gravel Co. Plant to Be Completed in April

WORK is progressing rapidly on the new $50,000 washing plant of the Bausman Washed Sand and Gravel Co. at Troy, Ohio. Ralph Bausman, who leased the gravel property from Mrs. M. Gabriel, has stated that the plant will be ready for operation by April 15. At present a steam shovel is stripping the site of the pit, and at the same time remodeling is being done in the buildings of the farm to permit the house to be taken over by the plant superintendent, and to turn the barn into a garage for the fleet of trucks which the company will operate. Work is expected to start soon on the construction of a siding to the plant from the B. & O. R. R., which will have a capacity of 28 cars. Mr. Bausman stated that contracts for approximately 50,000 yd. of sand had already been received, including a contract for 18,000 yd. for graveling the Troy-West Milton pike. —*Troy* (Ohio) *News.*

New Corporation Formed to Take Over Reed Gravel Company

THE A. Y. Reed Gravel Corp. has been organized and incorporated to absorb the business of the A. Y. Reed Gravel Co., of Elgin, Ill. The executive offices of the new concern will be located in the Builders' Bldg. in Chicago. The new company will take over the business founded by the late A. Y. Reed in 1909, and will expand its activities, operating extensive gravel pits on the west bank of the Fox river north of Elgin. Charles E. Jacobs of Chicago, who has been identified with the original company since its founding, will become general manager and vice-president of the new corporation. Herman Grotmeyer will remain in his position as superintendent.

Sand and Gravel Co. of Omaha, to Open New Pit

THE Sand and Gravel Co., of Omaha, Neb., has recently completed another purchase of gravel land near Plattsmouth, Neb., and is preparing to get production started early in April from the new pit. The present purchase is the property known as the Nord farm, which was owned by David Rutherford, and for which the gravel company paid $20,000. This company also bought a nearby tract of land from T. H. Pollock for $10,000 several months ago, so that the company now controls sufficient property to start production on a good scale. At present new machinery is being installed for a production of 50 carloads per day. The company is also remodeling the building on the Nord farm to be used as residences for employes. The new pits are located immediately south of the Platte river and near the C. B. & Q. R. R. tracks, so that they are supplied by good facilities for transporting the gravel. —*Plattsmouth* (Neb.) *Journal.*

W. A. Bechtel Building Crushing Plant in California

IMMEDIATE construction of a $200,000 rock crushing plant on the road between Oroville and Marysville, Calif., has been announced by W. A. Bechtel, a contractor of San Francisco. The plant is to be built primarily to produce one million tons of rock for the Western Pacific R. R., which is reballasting its line between Portola, Calif., and Oakland, a distance of about 300 miles. The plant, which will have a capacity of 4000 tons of crushed rock daily, is expected to be in operation by April.—*San Francisco* (Calif.) *Examiner.*

Kelly Sand and Material Co. Formed at Burlington, Iowa

THE Kelly Sand and Material Co. of Burlington, Iowa, has been organized to take over the property and business of the former Kelly Sand and Fuel Co. of Burlington. R. J. Dietlin is president of the new concern and Mark E. Smith is secretary and treasurer. The company has been incorporated for $50,000. The former company, which has been operating for many years, owned a dredge boat, a large river-front warehouse, and other equipment. The company operated its dredge on the Mississippi.

South Atlantic Crushed Stone Men Meet

AT the meeting of the South Atlantic Crushed Stone Association held in Raleigh, N. C., on February 20, E. N. Ragland of Raleigh was elected president. The other officers named were G. D. Lott of Columbia, S. C., and Harry Eagan, Salisbury, N. C., vice-presidents, and R. C. Mills, Salisbury, secretary. The association covers North and South Carolina, Virginia and Florida. An address was given at the convention by Frank Page, state highway commissioner of North Carolina, in behalf of good roads.

Illinois Sand and Gravel Association Meeting

THE annual meeting of the Illinois Sand and Gravel Association was held at Springfield, Ill., on February 28. At the business session, O. J. Ellingen, of Mendota, Ill., was re-elected president, and John E. Sankey, of Springfield, was again made vice-president. R. E. Weaver, Lincoln, Ill., will continue in the position of secretary-treasurer.

Parker Company Completing Gravel Plant at Monroe, Louisiana

A NEW gravel plant is being completed in Ouachita parish about six miles southwest of Monroe, La., by the Parker Gravel Co. This company, headed by C. A. Parker, at present has two large pits in operation in Webster parish. The new plant will be served by the Illinois Central R. R. It is reported that the gravel available at the new pit is in sufficient quantity to furnish a supply for several years' time.—*Monroe* (La.) *News Star.*

Rome Concrete Products Co. Formed at Rome, Ga.

THE Rome Concrete Products Co., of Rome, Ga., has been organized by F. G. Burghart, of Miami, Fla., and the plant of the company is now turning out about 2000 blocks per day. Mr. Burghart is still connected with the Bradford & Burghart Co., cement products manufacturers, of Miami, Fla. The Miami plant has been successfully operated for a number of years.—*Rome* (Ga.) *News-Tribune.*

Errata

IN the account of the convention of the American Institute of Mining Engineers printed in Rock Products for March 3, it was stated on page 71 that the grader used by the Silica Products Co. of Guion, Ark., had a capacity of 2.5 tons per hour, whereas it should have been 12.5 tons per hour.

The Dewey Portland Cement Co., Davenport, Iowa, advises that they are not going to enter the manufacture of cement products, as was stated in an item on page 98 of the February 18 issue of Rock Products. The change planned by the company is the production of commercial crushed stone, as was also stated in the above mentioned item.

The Limestone Products Corp. of America, Newton, N. J., through a letter by Mr. Bixler, the president, calls attention to the error in an item published on page 122 of the January 21 issue of Rock Products, in which it was stated that the company had purchased a 10-ton crawler steam shovel. Naturally, the steam shovel was nothing as small as a 10-ton shovel, although Mr. Bixler has not stated the exact size.

In Rock Products for January 21, in the account of the machinery and equipment exhibit at the convention of the National Crushed Stone Association, it was stated that the Armstrong Mfg. Co. of Waterloo, Iowa, exhibited a model of a "wire lined drill bit" (page 76). The item should have stated that the model was of a wire line derrick for drilling with wire cable, such as the company's special derrick with wire line shock absorber, which permits efficient drilling with wire cable instead of hawser-laid manila rope.

California Materials, Inc., Completes New Plant

REPRESENTING a total investment of more than $1,000,000, the new crushing, washing and screening plant of California Materials, Inc., of Los Angeles, has just been completed and placed in operation at Irwindale, near Los Angeles, in the San Gabriel Wash. The new plant has a capacity of approximately 6000 tons in a 10-hour day, which is three times greater than the former output of the company. Provision for the future installation of additional equipment that will almost double this production has been made in the construction of the new plant, and expansion will be made when the demand warrants it. The new plant is said to be one of the best equipped and finest in the west.—*Los Angeles* (Calif.) *Times.*

Swartz Sand Co. to Open New Pit at Wichita

THE Swartz Sand Co., of Wichita, Kan., will open new pits on the west bank of the Arkansas river, adjoining the Wichita city limits on the south, according to an announcement made recently by Frank J. Swartz, president of the concern. A 15-year lease has been taken on the Shallmo property, which gives the Swartz company half a mile of river front. Switch tracks from the Midland Valley R. R. will be laid to the new beds and a modern sand plant will be erected. The Swartz company is now operating a plant on Douglas Avenue in Wichita. —*Wichita* (Kan.) *Eagle.*

Asbestos Companies Sued by Government

THE United States government filed suit recently in the United States District Court under the anti-trust laws against the Johns-Manville Corp., Phillip Carey Manufacturing Co., Keasbey & Mattison, importers and manufacturers of asbestos and also against Dillon, Read & Co. and Clarence Dillon individually and the Asbestos Corp., Ltd., of Canada.

The government charges that these companies have brought about a monopoly of the asbestos business of the United States. The three manufacturing companies mentioned, according to the government's complaint, heretofore imported two-thirds of the asbestos used in this country.

These three companies joined with Dillon, Read & Co. in the formation of a new Canadian corporation, the Asbestos Corp., Ltd., the government claims. The new company has gained control of all asbestos not already controlled by the three older companies. It is further charged by the government that the Asbestos Corp. entered into an agreement with the three American companies to maintain a fixed schedule of prices in the United States. These prices, the government alleges, are substantially higher than prices existing before the agreements were entered into and the result has been the formation of a monopoly of the asbestos business in the United States.

The government further sets forth that in 1925 Duval R. Goldthwaite, who acted in the matter for Dillon, Read & Co., secured contracts from Johns-Manville Corp., Phillip Carey Co. and Keasbey & Mattison Co. providing that Dillon, Read & Co. should purchase a half control of all asbestos imported into the United States and not required by these companies in their immediate manufacturing business. This agreement was for a period of five years. Dillon, Read & Co. afterward assigned to the Asbestos Corp., Ltd., this contract.—*Wall Street News.*

Dennis Construction Company Opening New Quarry in Washington

PREPARATIONS for extensive quarrying operations on the west bank of the Willapa river, at the "Narrows," are being made by the S. L. Dennis Construction Co. of Raymond, Wash. The location is a little above South Bend, Wash. The company has acquired a strip of land including the greater portion of the basalt rock cliff along the river at the "Narrows." The property includes the site of an old quarry. A crusher with a capacity of 300 yd. per day will be installed, and bunkers will be built at the water's edge to allow shipments to be made by scow. A roadway is being built to the main road about one-half mile distant. Operations are expected to start about the first of May.—*South Bend* (Wash.) *Journal.*

Pioneer Company Buys Fleet of Tugs

SALE of the fleet of the Anderson Towboat Co. to the Pioneer Sand and Gravel Co. of Seattle for an unnamed consideration has been recently announced. The deal involves the transfer of six tug boats and three barges and, according to officials of the Pioneer company the craft will be operated under a holding company to be named the Pioneer Transport Co. The Pioneer Sand and Gravel Co. has greatly enlarged the scope of its activities recently and is itself a heavy user of towboats and barges to handle the large quantities of sand and gravel to and from its bunkers.—*Seattle* (Wash.) *Post-Intelligencer.*

Wilcox Buys New Gravel Pit at Grant's Pass, Ore.

IN anticipation of the exhaustion of available river gravel at his plant on the north branch of the Rogue river, Roy Wilcox, of Grant's Pass, Ore., has purchased the Schnell gravel pit near his own, and will start immediate construction of a spur track to it from the tracks of the California and Oregon Coast railway. The spur will be about 700 ft. in length. For the present a bunker will be located at the Schnell pit, from which Mr. Wilcox will make all rail shipments, but it is his intention to move his present plant from Rogue river to the new pit later in the year.—*Grant's Pass* (Ore.) *Bulletin.*

Florida Stone Producers Protest Entry of Cuban Stone Free of Duty

FLORIDA producers of crushed stone suitable for concrete and other character of construction and pavement recently complained to Senator Duncan U. Fletcher that they were considerably hampered on account of the importation, free of duty, of crushed, washed and sized stone from Cuba. Senator Fletcher laid the complaint before Secretary Mellon of the Treasury Department, who stated in reply that under the provisions of article 1 of the reciprocal commercial agreement between the United States and the republic of Cuba, dated December 11, 1902, articles which were then imported into the United States from Cuba free of duty would continue to be admitted free of duty into the United States, and section 320 of the present tariff act provides that nothing in the act shall be construed to abrogate or in any manner impair or affect the provisions of this treaty.

Mr. Mellon states: "The question of the classification of crushed limestone from Cuba was given careful consideration and the collector of customs at Tampa, Fla., was advised in a letter dated September 8, 1924, that the decisions under the tariff act of 1897 uniformly held crushed stone to be free of duty under paragraph 614 of the said act, and that following these decisions crushed stone imported into this country was passed free of duty."

The question was presented whether washing and sizing the stone renders it subject to a different classification, but the government decided that it did not, and therefore the action of the collector of customs at Tampa in admitting such stone to free entry must, accordingly, be approved.

Eureka Flint and Spar Co. Reorganized

A NEW company, the Eureka Flint and Spar Co., has been formed recently to take over and to expand the present company bearing the same name. The concern will have its offices on New York Avenue, Trenton, N. J. The new company will continue to operate the feldspar grinding mill and the raw material properties. Thomas H. Thropp and John C. Wilkes, of Trenton, and Frank W. Thropp, of Morrisville, Penn., are the organizers of the company, which is capitalized at $1,350,000.—*Iron Age.*

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	.....	1.60	1.30	1.30	1.30
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@1.00	1.35@1.50	1.15@1.50	1.10@1.15	1.05@1.10	1.05@1.10
Ft. Spring, W. Va.	.50	1.40	1.40	1.35	1.20	.....
Munns, N. Y.	1.00	1.50	1.50	1.50	1.25	.....
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que. (n)	.80	1.45	1.15	.95	.95	1.10
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	1.75	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.50	.50	.50	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	.90@1.25	.80@1.35	1.00@1.35	.90@1.35	.90@1.35	.....
Cypress, Ill.	1.25	1.15	1.10	1.00	1.00	1.00
Dubuque, Iowa (h)	.80	1.40	1.40	1.40	1.35	1.35
Greencastle, Ind.	1.25	1.15	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa (f)	1.10	1.55	1.55	1.55	.....	.....
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.....	.....	1.20	1.10	1.00	.....
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90@1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.90	.90	.90	.90	.90	.90
Wisconsin Points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Cartersville, Ga.	1.65	1.65	1.65	1.35	1.15	1.15
Chico and Bridgeport, Tex.	1.00	1.30	1.25	1.20	1.15	1.10
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Graystone, Ala.	Crusher run, screened, $1 per ton					
Kendrick and Santos, Fla.	3½ in. and less, $1 per ton					
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis Co., Mo. (p)	1.25	1.25	1.00	1.00	1.00	1.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	3.00	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90@1.00	2.25	1.75	1.55	1.25	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	.....
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.35@1.40	2.10	1.40@1.90	1.40@1.50	1.40@1.50	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
San Diego, Calif.	.50@ .75	1.25@1.50	1.25@1.50	1.10@1.25	1.10@1.25	.....
Springfield, N. J.	2.00	2.10	2.10	1.60	1.60	.....
Toronto, Canad (m)	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.	.50	1.75@1.90	1.75@1.90	1.75@1.90	1.60@1.75	.....
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	1.00	.....	2.35	.....	.....	.....
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	.....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)			1.50 to 1.85			
Toccoa, Ga.	.....	.....	1.30	1.25	1.20	1.20

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. High calcite fluxing stone, 1.40. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery. (n) Crusher run for ballast, .80. (p) Carload prices. (q) Crusher run, 1.40.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh	4.50
Atlas, Ky.—90% thru 100 mesh	2.00
50% thru 100 mesh	1.00
Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh	1.50
Blackwater, Mo.—100% thru 4 mesh	1.00
Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh	5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 50% thru 50 mesh	1.50
Cartersville, Ga.—90% thru 4 mesh	1.50
Pulverized, per ton	2.00
Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk	2.50
Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; all sizes	1.25
Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked	5.00
Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags	3.95
Bulk	2.70
Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk	2.75
Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk	2.70
Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk, 1.75; bags	3.75
Marl—Analysis, 90% $CaCO_3$; 10% $MgCO_3$; bulk, 2:25; bags	4.00
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis 99.05% $CaCO_3$; 90% thru 50 mesh	6.00
Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk	1.35@ 1.60
Olive Hill, Ky.—90% thru 4 mesh	1.00
Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100	2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk	3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk	5.50
Rocky Point, Va.—Analysis, $CaCO_3$, 97%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk	2.00
Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk	2.50

Agricultural Limestone

(Crushed)

Atlas, Ky.—90% thru 4 mesh	1.00
Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5%; $MgCO_3$; 90% thru 10 mesh	1.50

(Continued on next page)

Agricultural Limestone

Chico and Bridgeport, Tex. — 50% thru 100 mesh	1.50
Danbury, Conn.; Adams, Ashley Falls and West Stockbridge, Mass.—Analysis, 90% $CaCO_3$, 5% $MaCO_3$; 90% thru 50 mesh, bulk	3.50
100-lb. paper bags	4.75
100-lb. cloth bags	5.25
(All prices less .25, 15 days.)	
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Spring, W. Va.—Analysis, 90% $CaCO_3$; 50% thru 50 mesh	1.50
Kansas City, Mo. — 50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Linwood, Iowa — Analysis, 96-86.5% $CaCO_3$, 1.39% or less $MgCO_3$; 100% thru 4 mesh	1.00
40% thru 50 mesh	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 76.60% $CaCO_3$; $MgCO_3$, 22.83%, 100% thru 20 mesh; 50% thru 100 mesh, paper bags, 4.50; burlap bags	5.00
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha. Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.35
Valmeyer, Ill.—Analysis, 96% $CaCO_3$, 2% $MgCO_3$; 100% thru 10 mesh	.90@1.50

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—Analysis, 55% $CaCO_3$; 45% $MgCO_3$; 95% thru 100 mesh; paper bags	3.50
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@ 3.50
Rocky Point, Va.—85% thru 200 mesh, bulk	2.25@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Cedarville and S. Vineland, N. J.	*1.75@ 2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Klondike, Mo.	2.00
Massillon, Ohio	3.00
Michigan City, Ind.	.35
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.00
St. Louis, Mo.	2.00
Utica and Ottawa, Ill.	.75@ 1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	.65@1.00
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50
Ohlton, Ohio	1.75	*1.50
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.25
Ohlton, Ohio	1.75	*1.50
Red Wing, Minn.		1.00
San Francisco, Calif.	3.50	3.50

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N.J.	.65	.55	1.00	1.35	1.40	
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05		1.05
Erie, Penn.	.60				1.40	
Machias Jct., N. Y.	.85	.65	.65		.65	.65
Montoursville, Penn.	1.00	.80	.75	.65	.65	.60
Northern New Jersey	.50@ .90	.50@ .90		1.25	1.25	1.25
Portland, Me.	1.00	1.00	2.50		2.25	
Somerset, Penn.		2.00				
Washington, D. C.	.60@ .85	.60@ .85	1.70	1.50	1.30	1.30
CENTRAL:						
Attica, Ind.			All sizes .75@.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.25@ .80	.50@ .70	.10@ .40	.50@ .70	.60@ .80	.60@ .80
Barton, Wis.		.55	.75	.75	.75	.75
Columbus, Ohio		.85	.85	.85	.85	
Des Moines, Iowa		.30	1.30	1.30	1.30	1.30
Eau Claire, Chippewa Falls, Wis.	.50	.50	.65		.95	
Elkhart Lake, Wis.	.60	.50	.40	.56	.50	.50
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio	1.00	1.00	1.00		1.00	
Hersey, Mich.		.50		.60	.70	.70
Humboldt, Iowa	.35	.35	1.35	1.35	1.35	1.35
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Mankato, Minn.		.45g		.60@1.25h	.70@1.25	1.25e
Mason City, Iowa		.50	1.25	1.25	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.65*	.65*	1.75*	1.75*	1.75*	1.75*
St. Louis, Mo.	1.20e	1.45f	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.85	.85	.85	.85	.85	.85
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.15	1.10
SOUTHERN:						
Brewster, Fla.	.45	.45	3.00			
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.	.45@ .50					
Ft. Worth, Texas						.85
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.10
Macon, Ga.	.50	.50				
New Martinsville, W. Va.	1.00	.90@1.00		1.30@1.40		.80@ .90
Roseland, La.	.25	.15	1.25	.85	.45@ .65	
WESTERN:						
Kansas City, Mo.	.70	.70@ .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@ .40	.10@ .40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Phoenix, Ariz.	1.25	1.00	1.50	1.25	1.10	1.00
Pueblo, Colo.	.80	.60		1.20		1.15
San Diego, Calif.		.40@ .50	.80@1.00	.80@1.00	.65@ .80	.65@ .80
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Des Moines, Iowa	.50					
Dresdon, Ohio	.60@ .75	.70	.60	.80	.75	.65
East Hartford, Conn.	.85*d					
Eau Claire, Chippewa Fls., Wis					.65	
Ft. Worth, Texas						.85
Gainesville, Texas						.55
Grand Rapids, Mich.						
Hamilton, Ohio				.50		
Hersey, Mich.					1.00	
Indianapolis, Ind.				.50		.50
Moline, Ill. (b)	.60	.60	Mixed gravel for concrete work, at .65			
Oregon City, Ore.	1.25*	1.25*	Concrete gravel, 50% G., 50% S.,1.00			
Somerset, Penn.		1.85@2.00	1.25*	1.25*	1.25*	1.25*
Steilacoom, Wash.	.25			1.50@1.75		
St. Louis. Mo.						
Summit Grove, Ind.	.50	.50	Mine run gravel, 1.55 per ton			
Winona, Minn.	.40	.40	.50	.50	.50	.54
York, Penn.	1.10	1.00	.60	.60	.60	.60

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less. ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramee River. (g) Washed and screened river sand. (h) ¾-in. to ¼-in.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.50	2.75	1.75		4.00	
Beach City, Ohio	1.75@2.00	1.75@2.00		1.75	1.75@2.00		
Dresden, Ohio	1.50@1.75	1.25@1.50	1.50@1.75	1.25			
Eau Claire, Wis.						3.00	
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Kerrs, Ohio	1.10@1.50	1.25@2.00	2.00			2.75@3.00	
Klondike, Mo.				2.00	2.00		2.00
Massillon, Ohio	2.25	2.25		2.25	2.50		
Michigan City, Ind.				.30@.35			
Montoursville, Penn.				1.35@1.50			
New Lexington, O.	2.25	1.25					
Ohlton, Ohio	1.75	1.75		2.25	1.50	2.00b	1.75b
Ottawa, Ill.						3.50	
Red Wing, Minn.(d)					1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.	Pottery sand, 8.00@12.00						
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Warwick, Ohio	1.50*2.00	1.50*@2.00	1.75	1.50*@2.00	1.50*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (b) Damp. (c) Shipped from Albany. (d) Filter sand, 3.00. (e) Filter sand, 3.00@4.25. (f) Crude and dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	⅜ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*	1.45*	1.45*
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95[4]
Chazy, N. Y.		8.50	7.50	10.00		15.50[1]	8.50	14.00
Lime Ridge, Penn.							5.00[3]	
West Stockbridge, Mass.	12.00	10.00	5.60					2.00[13]
Williamsport, Penn.			8.50@9.50		7.00	9.00	5.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50@9.50[7]	8.50@9.50[7]	8.50@10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.							7.80	1.35
Carey, Ohio	11.50	7.50	7.50		9.00		8.00	1.50
Cold Springs, Ohio		8.50	8.50				8.00	
Gibsonburg, Ohio	11.50				9.00	11.00		
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio[8]	11.50							
Milltown, Ind.		8.50@10.00			10.00[8]		8.50[22]	1.35[10]
Scioto and Marble Cliff, O.		8.50	8.50		9.50	8.25	.62½ 7.50	1.50[3]
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	8.50	8.50	12.50	8.00	10.00[9]	9.00	1.50[3]
SOUTHERN:								
El Paso, Texas							7.00	
Frederick, Md.		9.00	9.00	9.50	7.50	9.00	7.50	9.00
Graystone, Ala.	12.50	10.00		12.50		1.40[14]	8.50	1.50
Keystone, Ala.		10.00	8.00	10.00	8.00		8.00	1.50
Knoxville, Tenn.	20.25	8.50	8.50	8.50			7.50	1.35
Ocala, Fla.	14.00	12.00	11.50	12.00			11.50	1.60
WESTERN:								
Portland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Los Angeles, Calif.	16.00		16.00	16.00			16.00	
San Francisco, Calif.	20.00	20.00	13.50	21.00			14.50[20]	2.15
Tehachapi, Calif.[12]	17.00	15.00	12.00@15.00[11]	17.00	16.00		16.00	2.00
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] 180 lb. [6] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [14] Per 2 bags of 90 lb. each. [21] To 9.00. [20] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Utica & Ottawa, Ill.	1.00@3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel crayons, gross	1.00@ 2.80
Chatsworth, Ga.:	
Crude talc, grinding	5.00
Ground talc (150-200 mesh)	7.00@10.00
Pencils and steel crayons, per gross	1.00@ 1.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	9.00@10.00
Same, burlap bags, bags extra	8.00@ 9.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc (for grinding)	5.00
Ground talc (150-200 mesh), bags	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Glendon, N. C.:	
Ground talc (150-200 mesh), bulk	6.00@10.00
Ground talc (150-200 mesh), bags	8.00@14.00
Pencils and steel crayons, gross	1.05@ 2.00
Blanks, .08 per lb.; cubes	50.00
Hallesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.50
Ground talc (150-200 mesh), bags	8.00@14.50
Joliet, Ill.:	
Ground talc (150-200 mesh) in bags:	
California white	30.00
Southern white	20.00
Dark	10.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Columbia, Tenn.—B.P.L. 65-70%	3.50@ 4.50
Gordonsburg, Tenn.—B.P.L. 65-70%	3.75@ 4.00
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00

Ground Rock

(2000 lb.)

Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72.5%	9.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida — F.o.b mines, gross ton, 68/66%, B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50@24.00
Roofing mica	37.50
Punch mica, per lb.	.12

Cut mica—50% from Standard List.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt. — English pink, English cream and coral pink	*12.50	*12.50
Brandon grey	*12.50	*12.50
Brighton, Tenn.—Pink marble chips	§3.00	§3.00
Crown Point, N. Y.—Mica spar		9.00@10.00
Easton, Penn.—Green stucco		12.00@18.00
Green granite		14.00@20.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash		8.00@16.00
Middlebrook, Mo.—Red		20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags		4.00@ 5.50
Phillipsburg, N. J.—Royal green granite		15.00@18.00
Readville, Mich.—Crystalite crushed white marble, bulk	4.00	4.00@ 7.00
Rose pink granite, bulk		12.00
Stockton, Calif.—"Natrock" roofing grits		12.00@18.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	
Wauwatosa, Wis.		10.00@15.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 16.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 40 mesh to 200 mesh	15.00@28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; Arizona spar, crude, bags, 12.50; bulk	11.50
Pulverized, 95% thru 200 mesh; bags, 19.73@23.50; bulk	18.73@22.50
Pulverized, 20% thru 80 mesh; bags, 16.75@22.00; bulk	15.75
"Imperial" feldspar, 200 mesh; bags, 23.50; bulk	22.50
"Riverside" spar, 200 mesh; bags, 17.60@20.00; bulk, in quantity	13.65
20% thru 80 mesh; bags, 17.60@20.00; bulk, in quantity	13.65
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; Si_2O, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk	18.00
Crude	9.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O_3, 3%; 68% SiO_2; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich. (Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.; Adams, Ashley Falls, and West Stockbridge, Mass. (Limestone)	‡7.50@*9.00
Easton, Penn.—In bags	8.00
El Paso, Tex.—Per ton	1.00
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton, including sacks	15.00
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Gypsum), bulk, per ton	10.00
Tuckahoe, N. Y.	8.00
Warren, N. H.—(Mica), per ton	3.85@ 3.90
Waukesha, Wis.—(Limestone), per ton	8.00
Wisconsin Points—(Limestone), per ton	15.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	10.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	13.00@16.00*
Farmington, Conn.	13.00
Flint, Mich.	¶11.50@19.00c
Factory jobs, f.o.b. plant, net	13.25
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00@19.00*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00
New Brighton, Minn.	10.00
Pontiac, Mich.	16.00*
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50b
San Antonio, Texas	16.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	18.00@20.00
Toronto, Canada	13.50@16.00*†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	14.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M, 10th of month. (b) Red, $16. (c) Less than 2000, 5% discount, delivered; more than 2000, 10% and 5% discount, delivered.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.		2.35
Baltimore, Md.		2.15@2.25
Birmingham, Ala.		2.10
Boston, Mass.		2.13@2.23
Buffalo, N. Y.		2.00@2.10
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa		2.24
Charleston, S. C.		2.35
Cheyenne, Wyo.	.82¾	3.31
Chicago, Ill.	.51¼	2.05
Cincinnati, Ohio		2.22
Cleveland, Ohio		2.24
Columbus, Ohio		2.22
Dallas, Texas		2.00
Davenport, Iowa		2.24
Dayton, Ohio		2.24
Denver, Colo.	.66¼	2.65
Des Moines, Iowa		2.05
Detroit, Mich.		1.90
Duluth, Minn.		2.04
Houston, Texas		2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.		2.10
Jacksonville, Fla.		2.20
Jersey City, N. J.		2.03@2.13
Kansas City, Mo.		1.92
Los Angeles, Calif.	.60	2.40
Louisville, Ky.	.55½	2.22
Memphis, Tenn.		2.10
Milwaukee, Wis.		2.20
Minneapolis, Minn.		2.12@2.22
Montreal, Que.		1.36
New Orleans, La.		2.07
New York, N. Y.		1.93@2.03
Norfolk, Va.		2.07
Oklahoma City, Okla.		2.46
Omaha, Neb.		2.36
Peoria, Ill.		2.22
Philadelphia, Penn.		2.11@2.21
Phoenix, Ariz.		3.26
Pittsburgh, Penn.		2.04
Portland, Colo.		2.80
Portland, Ore.		2.40‡@2.60
Reno, Nev.		2.91
Richmond, Va.		2.24@2.34
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.		2.21
Savannah, Ga.		2.50
St. Louis, Mo.		1.95
St. Paul, Minn.		2.12@2.22
Seattle, Wash.		2.50†@2.65
Tampa, Fla.		2.25
Toledo, Ohio		2.20
Topeka, Kan.		2.41
Tulsa, Okla.		2.33
Wheeling, W. Va.		2.12
Winston-Salem, N. C.		2.44

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Buffington, Ind.		1.80
Chattanooga, Tenn.		2.45*
Concrete, Wash.		2.35
Davenport, Calif.		2.45*
Hannibal, Mo.		1.90
Hudson, N. Y.		1.75
Leeds, Ala.		1.65
Lime and Oswego, Ore.		2.50‡
Mildred, Kan.		2.35
Nazareth, Penn.		2.15
Northampton, Penn.		1.75
Richard City, Tenn.		2.05
Steelton, Minn.		1.85
Toledo, Ohio		2.20
Universal, Penn.		1.80

NOTE—Add 40c per bbl. for bags.
*Includes sacks.
†10c discount, 10 days. ‡10c discount, 15 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u					11.70u			
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50			13.50			
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.					14.30o	12.30m		m9.00@11.00o					
Delawanna, N. J.								7.25			13.00	14.00	
Douglas, Ariz.			6.00	14.50	15.00		18.00		30.00				
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50		24.55	20.00			
Gypsum, Ohio	3.00	4.00	6.00	7.00	9.00	9.00	18.00	7.00	27.50	19.00			
Los Angeles, Calif.			7.50@9.50	11.50y									
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00		20.00	30.00
Portland, Colo.				10.00									
San Francisco, Calif.			9.00	13.40	14.40		15.40						
Seattle, Wash.	6.60	10.00	10.00	13.00									
Sigurd, Utah									21.50				
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00					20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
(m) Includes paper bags; (o) includes jute sacks; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	16.00	.....	.....
Detroit, Mich. (d)	.16	.....	.18
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	15.00*	.....	.....
Graettinger, Iowa	.16@ .18	.....	.....
Indianapolis, Ind	.10@ .12a	.....	.....
Los Angeles, Calif.	4x8x12—5.00*	4x6x12—4.20*	
Oak Park, Ill.	18.00	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18@ .20	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red, Yellow, Gray, and Orange	Green, Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35

†Price per square.

Houston, Texas—Roofing Tile, per sq. 25.00

Indianapolis, Ind.—9x15-in.

	Per sq.
Gray	10.00
Red	11.00
Green	13.00

Waco, Texas:

	Per sq.
4x4	.60

Cement Building Tile

	Per 100
Cement City, Mich.: 5x8x12	5.00
Columbus, Ohio: 5x8x12	6.50
Grand Rapids, Mich.: 5x8x12	8.00
Longview, Wash.: 4x6x12	5.00
4x8x12	6.25
Mt. Pleasant, N. Y.: 5x8x12	78.00
Houston, Texas: 5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
Yakima, Wash. (Building Tile): 5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Columbus, Ohio	16.00	17.00
El Paso, Tex.—Clinker	11.00	.....
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	20.00@32.00
Mt. Pleasant, N. Y.	.....	14.00@ 23.00
Oak Park, Ill.	.....	37.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@ 55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.00@ 25.00
Rapid City, S. D.	17.00	25.00@ 35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in
Detroit, Mich.	15.00 per ton																
Grand Rapids, Mich.	4 in. to 12 in., 72% off standard sewer price list; 15 in., 65% off; 18 in. to 24 in., 62% off; 27 in. to 36 in., 60% off																
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.	Sewer pipe 40% off list; culvert—list																
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.	6 in. to 24 in., $18.00 per ton																
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.	12.00 per ton																
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.70	.....	2.00	.....	2.75	3.40	.....	6.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Yakima, Wash.	.....	.....	.....	.....	.....	.....	1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

(a) 24-in. lengths; (b) Reinforced.
†21-in. diam. ‡Price per 2-ft. length.

Canada Cement Announces Price Reduction

A REDUCTION of 25 cents a barrel in the prices of portland cement in the prairie provinces was announced by the Canada Cement Co. An official statement says:

"The Canada Cement Co. has announced that effective immediately a price reduction of 25 cents per barrel on portland cement takes effect in western Canada, covering all the prairie provinces from Winnipeg west. This reduction is made in the hope of stimulating business in the west, where the consumption of cement has been extremely low since before the war. There is a sign of building revival in that section and it is hoped this will contribute further to that activity."—*Toronto* (Can.) *Mail & Empire.*

Prices for Building Material

THE latest bulletin of the Division of Building and Housing of the U. S. Department of Commerce provides an interesting study of the various prices for rock products in different sections of the country. The prices quoted are the average prices paid by contractors all over the United States for material delivered to the job, and for the sake of uniformity the prices are given as paid on February 1, 1928. For portland cement the lowest quotation is at Poughkeepsie, N. Y., where the price is $2.29 per bbl. The middle west shows considerable variation between the low price of $2.32 at Detroit, Mich., and $3.40 at Rockford, Ill. The highest price noted is $3.55 per bbl. at Tucson, Ariz. Along the Pacific coast prices are remarkably uniform, showing a variation of only 20 cents from the low price of $2.60.

Baltimore is low on the quotation for lime, and Detroit is only slightly higher. The prices were $13 and $13.60 respectively. The highest price quoted was $30 at Tucson.

The low price for ¾-in. crushed stone is noted at Los Angeles, where the price is $1.70 per ton, and the high price is $4.50 at Indianapolis. Prices in the east are from $1.80 to $3.50, in the middle west from $1.90 to $4.50, and on the Pacific about $1.75.

Sand prices are much the same over the whole country, ranging from $1.25 to $2.25. The low for the whole country is $1 at Columbia, S. C., and the highest price is $4.73 at Scranton, Penn.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Concrete Products Association Meets at Philadelphia

Discussion of Merchandising Products Given Much Attention

By D. R. ("Spec") Collins
Vice-President, Concrete Products Association

WITH an attendance representing practically every section of the United States the Concrete Products Association opened its annual convention Monday morning February twenty-seventh at the Benjamin Franklin Hotel, Philadelphia, for a day and a half session preceding that of the American Concrete Institute. Doubtless this was the most momentous of Concrete Products Association meetings, for not only was the association reorganized and the office of a full time executive secretary established, but the trend of the sessions and the undercurrent of thought and conversation in the lobbies adjacent to the convention hall told that the industry had "grown up" and was assuming a seriousness not recognizable at previous conventions. The men in attendance had come to Philadelphia to work, to learn definite things and to carry back with them something of value for the time and money expended on the trip.

Much of the convention dealt with the "new competition" between industries and methods of combating it. Merchandising, advertising and kindred subjects held sway for a goodly share of the program—not merely rambling dissertations, but papers filled with definite problems and definite solutions to these problems. Little was said on the convention floor regarding light weight aggregates as a solution to the "new competition," but it is doubtful if a single man left the convention without a more comprehensive knowledge of the light weight aggregate situation than he had before his attendance.

Opening Address

So well does the opening address of ***Sidney I. Crew,*** retiring president, reflect the trend of the whole meeting that it is given below almost in its entirity. "We are crossing," said Mr. Crew, himself a successful concrete products manufacturer of Norwood, Ohio, "the threshold of the most promising era in the history of the concrete products industry. Each year that we have met together as state associations and a national organization has been a step forward. A new importance in the building industry has come to our product; but I am now convinced that we now stand at the begnning of a period of recognition never attained before.

D. R. (Spec) Collins

"As I look back over the early history of our business, with its hand molds and backyard methods, I cannot help but marvel at the change that has come over the industry. It is simply the survival of the fittest. If it had been possible to have gotten together a gathering of this sort in those days we might have hesitated to invite guests of prominence, feeling that they would not have been favorably impressed. In contrast it would be hard to distinguish our present gathering from one of bankers or professional men. This fact alone is a symbol of what has taken place in the industry. Each year sees men of more ability in our ranks, thus putting the concrete masonry unit on a constantly rising plane.

"The day is not far past when the quality of a concrete unit was an unknown variable. We are still faced in some instances with intense prejudice on that account. However, due to increased knowledge in methods of manufacture and the research work of such organizations as the Portland Cement Association, the American Concrete Institute, and other similar research bodies, I believe we are successfully passing that stage. Concrete products of poor quality today are more unusual than usual. In my own state of Ohio we are now operating under a quality standard that requires our product to withstand a compression test of one thousand pounds per square inch over the gross area. This is not only met with ease, but exceeded economically where proper methods of manufacture are used. Wherever a building ordinace has recognized our product and called for a high standard of quality, it has invariably worked for the benefit of the industry. Products production in Cincinnati has increased over four hundred per cent since our building ordinace went into effect about four years ago, while a greater change has taken place in the esteem in which our product is held.

Competition from Outside the Industry

"Formerly concrete products were thought of as a poor grade of building material with a reputation for being weak, damp and cheap. Now they are classed as a high grade building material to be used interchangeably with brick and wherever these may be used in the city. However, we cannot rest on our oars in our relations with building officials. Already in Cincinnati forces are at work to topple concrete products from the high pedestal of esteem which they have gained. The price of continued recognition is eternal vigilance.

"With our business removed from the class of small manufacturer to that of big business by reason of quantity production, improved machinery and methods, we shall be able to utilize every resource to further this end and to educate the public to the increased use of our product. Methods of merchandising are changing. We cannot wait now as we did in the past for orders to come to us. Each building project as it comes up will be watched and analyzed for a possible use of our product. The successful manufacturer will employ salesmen of ability and energy to do these things that we have neglected to do in the past. We shall use the medium of advertising to its fullest extent. In other words, if we are to be big business we shall have to use all the methods the words imply."

Review of 1927

In reviewing the progress of the past year ***W. D. M. Allan,*** manager of the Cement Products Bureau of the Portland Cement Association brought out the fact that in 1927 the concrete products manufacturers of the country not only made a substantial gain in the total volume of units produced, but for the first time in many communities were a definite factor in the backup business. He brought out the fact that the development of the use of such light weight aggregates as cinders and the newer haydite aggregates had developed a tremendous impetus to the backup class of business and were opening up markets that had heretofore been but slight. Mr. Allan urged the manufacturers to study their markets more closely, with the idea in mind of developing their manufacturing methods to those markets rather than stumbling along as many have done in the past and attempted to develop the markets to the manufacturing methods. During the past year according to Mr. Allan over 350,000,00 concrete building units have been marketed and manufactured in the United States. The economy of the use of cleaned and screened materials has been fully recognized by all progressive manufacturers with a consequent higher yield per sack of cement and a cutting of the cost of the product.

"Products manufacturers in rebuilding their plants to meet the new competition of industry against industry must learn not to overcapitalize," said Mr. Allan. "I am not making a plea to return to the backyard method of plant operation, but I do believe that the manufacturer who meets this new competition successfully will have a plant that is capable of running two or even three shifts a day rather than a huge plant that can operate at productive capacity one shift a day but part of the time."

Advertising Concrete Products

Newton D. Benson of Providence, Rhode Island, outlined carefully an advertising campaign that may be applied by the average sized plant. Mr. Benson pointed out that with a small expenditure the average plant is able to make a very effective coverage of his territory if careful plans for the expenditure of the advertising appropriation is made beforehand. Mr. Benson especially recommended a carefully drawn-up direct mail campaign followed up by personal solicitation to such prospects as were thought especially good and logical.

Following Mr. Benson, ***W. D. M. Allan*** again took the floor to tell what the Portland Cement Association had done in the past year to advertise concrete products. He then outlined the plans of the association for the coming year in the matter of advertising and brought forth the idea that the association was contemplating a series of merchandising schools to help the products manufacturers in all parts of the country with their sales problems. "The Portland Cement Association is preparing a number of very effective pieces of literature that can be used by products manufacturers if they only will," continued Mr. Allan. "We do not want this literature to become out of date on our shelves. Every piece of it is designed to build up a greater market for concrete products of various kinds and I hope that every one of the men present will get in touch with the District Office of the Portland Cement Association nearest them and secure their help in the use of this literature." He then touched on the association contribution to the products business in the way of national advertising during the coming year. Eighteen plans for small concrete masonry houses have been prepared by the Small House Service Bureau and are being run in leading newspapers throughout the country. A most effective hookup with these plans can be made by local manufacturers' in every instance of their publication.

Value of National Advertising

Major I. D. Carson of N. W. Ayer & Sons, Philadelphia, ably followed Mr. Allan with a discussion of "The Value of National Advertising." Major Carson discussed advertising in general before launching into a description of a number of specific campaigns in the building industry which have brought much business to their sponsors. Touching on the "new competition" Major Carson made the prediction that during 1928 50% more would be spent by industries advertising as industries as a whole than in 1927. He brought out the fact that merchandising today must be more generally emphasized than in the past. In 1890, he said, the manufacturing cost made up 90% of the selling price while in 1927 this ratio had changed so that less than half of the selling price was comprised of the manufacturing cost, the balance being taken up by selling.

The farmer is coming back into the market during 1928, was the assertion of Major Carson. His income last year was over ten billions of dollars, which is $323,000,000 more than during 1926 and the highest in history with the exception of the years of 1918 and 1919. There will be a competition for this farmers' dollar greater than ever known before. Good roads, the radio, the automobile, the telephone have considerably broadened the sphere of the farmers life, have given him a greater intelligence and made him a greater factor in the community.

Major Carson, at a later session on the program called attention to the constantly increasing number of new buyers coming into the market for building materials. He pointed out that there were practically 660,000 weddings in the country every year, making a potential market for that many homes. The real competitor of the home builder and the man who manufactures materials to go into homes is the maker of luxuries that tend to draw people away from home and home life. It is up to the builders of the United States to sell the idea of a home and of home life so thoroughly that the public will have a tendency to invest money in homes before spending it on some luxury of a small material worth. Perhaps the more interesting part of this second appearance of Major Carson on the program was a number of graphs and charts which he showed that demonstrated conclusively the value of association advertising. No less than twenty trade association advertising campaigns and the results obtained from them were graphically shown by Major Carson and were the stimulating thought for similar action on the past of the Concrete Products Association. He advised, however, that advertising, to gain its end, must be done consistently and persistently.

Consolidations and Mergers

Comparing the development of the concrete products industry with that of the steel industry ***C. J. Herzog*** of the Consolidated Concrete Products Co. of Pittsburgh, Penn., opened the Tuesday session of the convention. Mr. Herzog in opening his talk traced the development of the concrete products business from its inception to the time of the "Pittsburgh consolidation," the forerunner of what is expected to be numerous similar moves. So intense has been the interest in this combine that much of Mr. Herzog's talk will be quoted verbatim. "The entry into the business by the Jerry block maker," he stated, "with his unscrupulous

business methods has caused many evils to creep into the business which it will take some years to eliminate. It might not be out of order to mention some of the evils here, namely, the return of unused blocks; selling direct instead of through the building supply dealers; non-uniformity of quality; poor credit facilities; lack of proper co-operation to promote the general use of the products, and many others too numerous to mention.

"The advent of the more or less automatic machinery, requiring larger investments and railroad sites, was the next step forward. This did much to put the business on a firmer foundation. It attracted a better type of individual and the block industry began to be recognized as a real business.

"Following the war many of the larger type of plants just mentioned were built to take care of the abnormal building demand. When the unusual tonnage was decreased the result was an overproduction capacity. These conditions as outlined represent in a general way what has happened in nearly every locality.

"The speaker will attempt to outline the Pittsburgh situation from here with the thought that it may help manufacturers in other localities. With this overproductive capacity and large capital investments the inevitable happened, namely, cut throat competition. However, in the face of such conditions one fact stood out sharply, and this was that the concrete products business was fast becoming a basic industry with great possibilities if properly financed and managed.

"With this idea in mind it was finally agreed to merge four of the larger plants located in the north, south, east and west districts of the city with sufficient financing to assure the success of the whole proposition. Many problems immediately arose. It was necessary to weld into one loyal organization what had formerly been four competing groups. Each individual must find his niche. A complete reorganization must be effected and of course some must be eliminated entirely. These and many other problems have been worked out fairly successfully during the past year.

Advantages of Mergers

"It may be well to mention some of the many advantages that this merger has made possible, as follows: (1) A centralized sales office and display room for the various products manufactured. (2) A considerable saving in overhead expense as compared with that of four separate companies. (3) An average reduction in hauling expense due to the advantageous location of the plants. (4) A saving in the purchase of raw material has been effected because of the much larger buying power. (5) The new company has very much better control of the credit and collection situation than did any of the individual companies. (6) Due to the better standing of the larger company it has been possible to correct some of the evils of the business as previously mentioned. (7) One of the most valuable things done by the company was the establishment of an engineering and research department. This department has done some very excellent work in reducing the weight of the standard units, thus effecting a considerable saving in material costs. A study of all available aggregates is being made which promises some further saving in raw material costs. This department has also developed some new reinforced units, one of which has already been accepted by the trade as a recognized concrete product. The unit referred to is a reinforced-concrete floor slab, which is made 12 in. in width and any length up to 10 ft. Some 200 contractors are regular users of this unit for porch floors. It has been passed by the city building department and several installations have been made in the business district of Pittsburgh on remodeling jobs and for flat roof construction. (8) An intangible, but nevertheless real benefit of the merger is the added influence and standing given the business as a whole by the men who made it financially possible. (9) The diversified line of concrete products manufactured and about to be manufactured gives the company a distinct advantage over its competitors. Whenever possible the newly-developed products are being covered by patents and in the near future the manufacturing rights will be licensed to similar companies in other cities.

The company is now manufacturing concrete blocks, concrete tile, concrete roofing tile in French, English and Spanish models, roof and floor slabs, California portland cement stucco and interior decorative plaster, and ornamental trimstone as well as colored concrete units. Within the next two months the company will add to its line cinder blocks and partition slabs.

Future of the Association

A reorganization of the Concrete Products Association was urged by the writer ***(D. R. Collins)***, as last speaker on the program. Stating that the association was faced with two critical years which could be met only by co-operative endeavor if the industry was to be sustained on a stable basis, some of the ills of the present organization were outlined and definite remedies suggested for them. "If we are to have mass production" it was stated, "—and the tendency is surely that way, we must have mass consumption to take it up. And so far as I can see our only hope of obtaining mass consumption is through constructive trade association promotion and activity. The Concrete Products Association CAN be the most vital single factor in safeguarding the prosperity of the concrete products industry—BUT every member must work ceaselessly for and with his fellow members. An industry of the magnitude of ours and with its potential possibilities should engage in research, advertising, standardization, merchandising, education. All these and other co-operative nature are essential and powerful weapons necessary in facing the competition of today."

(Mr. Collins' complete paper will be published in an early forthcoming issue of Rock Products.)

Business Session

Perhaps the most significant movement of the association in many years was the action taken at Philadelphia in employing ***F. O. Matthiessen*** of Philadelphia as executive secretary of the organization on a full time basis. Heretofore the office of secretary has been on a part time basis and has been cared for by a combined secretary-treasurer as a co-operative office to work with the Portland Cement Association, American Concrete Institute and other bodies engaged in similar work. Not only will the scope of activities of the associations work be broadened by this move of establishing a paid executive secretary but it is expected that its membership will be materially built up and strengthened. A definite program of activity was worked out at the many meetings of the directors held during the convention and it is expected that this will be announced within the next two weeks. Officers for the coming year are: President, Newton D. Benson, Providence, Rhode Island; First Vice-President, D. R. Collins, Milwaukee, Wisconsin, Second Vice-President, Austin Crabbs, Davenport, Iowa; Secretary-Treasurer, A. G. Swanson, Omaha, Nebraska.

Entertainment Features

One high light of the entire convention was the dinner and entertainment held for the manufacturers and their ladies in the Betsy Ross Room of the Benjamin Franklin on the evening of the opening day. Ten acts of vaudeville comprising the entertainment part of the program were furnished through the courtesy of manufacturers of nationally advertised and distributed concrete products machinery.

(A report of the joint session of the Concrete Products Association, and the American Concrete Institute, which followed the regular meetings of the association, will be found in the report of meeting of the American Concrete Institute elsewhere in this issue.)

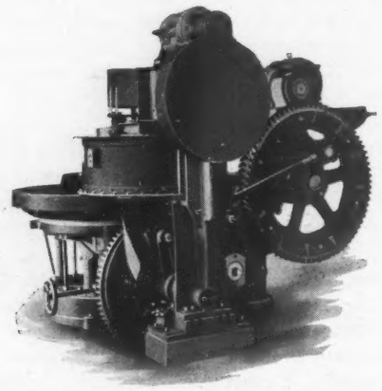
Riverhead Cement Block Co. Building Factory

THE Riverhead Cement Block Co., of Riverhead, N. Y., which was recently incorporated for $25,000, is building a 30x50-ft. factory on a 50-acre tract of land about a mile and a half north of the town. The land is owned by C. H. Young, treasurer of the company. In addition to manufacturing building blocks, the company will sell sand and gravel from the property. Raymond Corwin is president of the company and George Hawks is vice-president and general manager.—*Riverhead* (N. Y.) *Review.*

New Machinery and Equipment

New Type of Motor-Driven Sand-Lime Brick Press

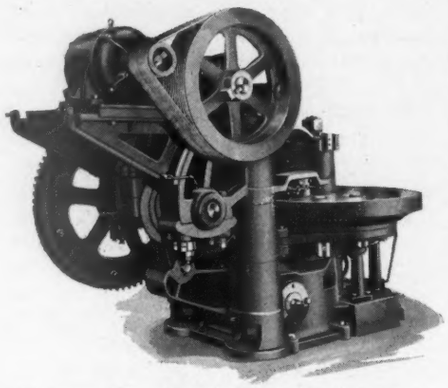
JACKSON AND CHURCH CO., Saginaw, Mich., are now building a motor-driven sand-lime brick press and material hopper, the whole driven through a Texrope drive and a motor-driven agitator. Push-button controls for the machine within reach of the operator's position and overload



New motor-driven sand-lime brick press

equipment of the motor control and a safety pin for instantaneous stopping of the machine in case of a jam, are some of the new features incorporated in the design. Through the use of the Texrope drive, the press motor can be set on brackets out of the way of dust and sand and thus makes a compact arrangement.

The table is turned by a positive drive through bevel gears. The ratchet consists of four specially shaped dogs locking into four notches and does not require great accuracy in setting to insure smooth starting



New sand-lime brick press showing short-center rope drive

of the table. The intermittent band brake releases just before the table starts to move and is applied just in time to stop the table smoothly and holds it while the brick are being pressed and moulds filled.

The moulds or pockets are protected from excessive wear by easily removed steel plates with extra hard saw blade liner inserts. The inserts may be changed without trouble and the moulds put into good condition without great expense, the manufacturers say.

The large gear is made in two pieces. A large ring gear is fastened with six bolts to a center and as it wears shifted to five other positions so that it can be completely worn out before requiring replacement. The table gear is similarly fastened to the table. The replacement can be furnished with a minimum cost, according to the manufacturers, since the centers do not have to be replaced. The changing does not require the fitting to shaft and fitting of a key but only unbolting and bolting on the new.

All bearings are properly bushed and lubricated with Zerk system and give long service if properly looked after. The bushings are easily changed when worn and the press kept in perfect running condition. Where necessary the wear can be taken up. The table has a hard steel plate on top to take the wear and it can be readily replaced when necessary.

The model 12 press shown herewith has a rated capacity of 3000 to 3300 brick per hour. Its weight is given as 26,000 lb.

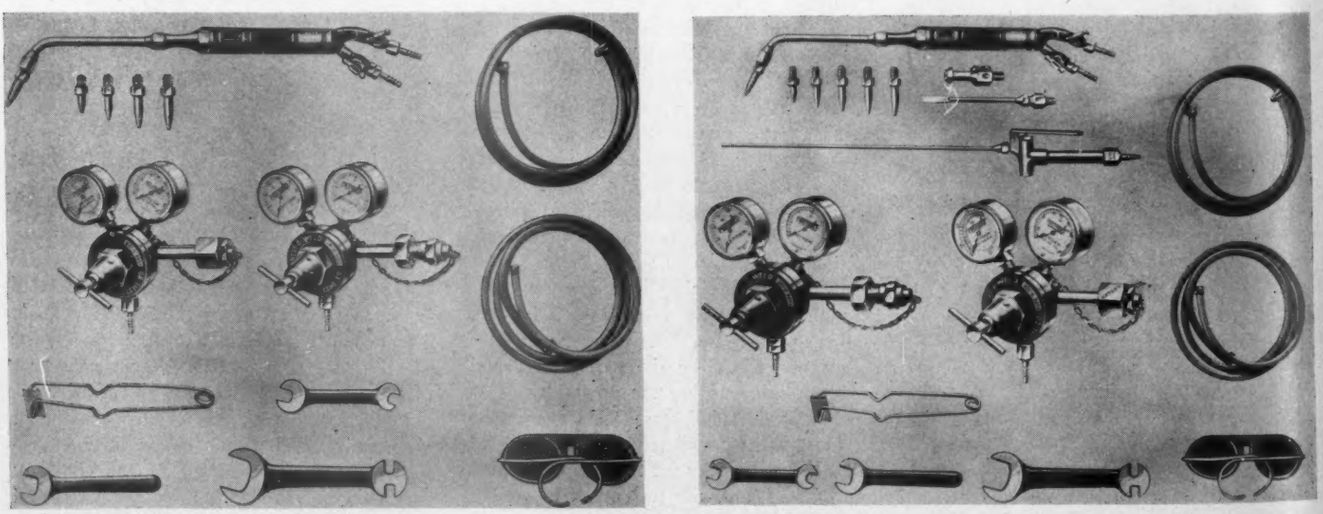
Three New Welding Outfits

THREE new Prest-O-Weld welding outfits, designated as the Type W-101-A auto repair outfits, the Type W-102-A general purpose outfit, and the Type W-102-B welding outfit, have been placed on the market by the Oxweld Acetylene Co., 30 East 42nd Street, New York City.

These outfits are made possible by the addition to the Prest-O-Weld line of two small, two-gauge regulators, Types R-106 and R-107, and two special blowpipe tips, one for heating and brazing and one for radiator soldering.

The Type W-101-A auto repair outfit is for the industrial plant garage that has only an occasional welding job but needs a large-size blowpipe for frame straightening.

The Type W-102-A general purpose outfit is for operator that wishes to employ the oxy-acetylene process in all its many applications — welding, decarbonizing, heating, soldering, brazing, lead burning and radiator repair. Five welding tips and a decarbonizing blowpipe, as well as the heating and radiator soldering tips, are included in this.



New welding outfits for (left) welding light and medium castings and (right) general purpose welding

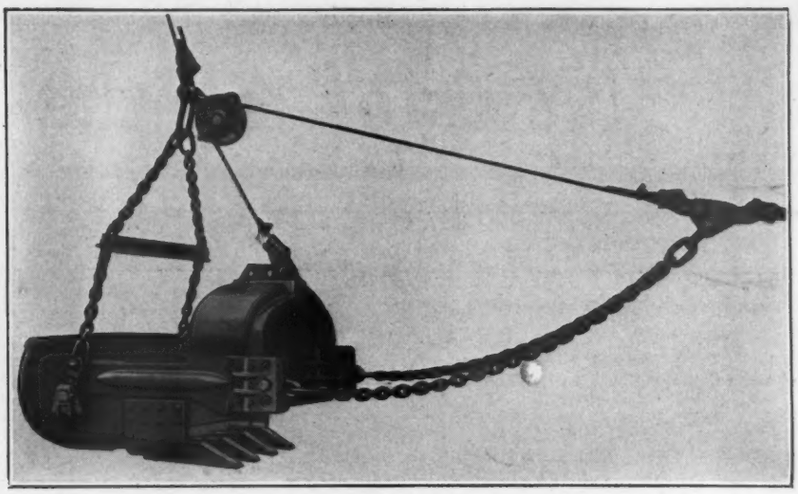
The Type W-102-B welding outfit is recommended for welding light and medium castings. This outfit, which includes five welding tips, is particularly adapted to production processes because the light weight of the blowpipe with its light 3/16-in. hose does not tire the operator even on continuous work.

By the addition of a cutting attachment any of these three outfits may be used for cutting wrought iron or steel.

New Type of Dragline Bucket

HARNISCHFEGER CORP., Milwaukee, Wis., is now manufacturing dragline buckets in sizes ranging from ½ to 1¼ cu. yd. These new buckets are designed to withstand severe dragline service. The bottom and sides are shaped from a single piece of heavy tank steel and all seams are electrically welded. Welded construction provides a smooth inside surface, and prevents sticky soil or weeds from clinging to the bucket. The bucket teeth are heavy steel forgings and are securely bolted through the cutting lip and bottom of the bucket. The new type of bucket has large box section hood and heavy "Z" bar supports.

The drag chain clevis is provided with lugs which pull against shoulders in the hitch plate thereby, it is said, transmitting the pulling stresses direct from the bucket to the chain instead of through the connecting pin. The pin acts as a guide and is not subject to bending strains, it is claimed. This type of hitch-plate makes it easy to adjust the cutting angle of the bucket, according to the manufacturers.



New type of dragline bucket of welded construction

New Roller-Bearing Jaw Crusher

THE GOOD ROADS MACHINERY CO., Philadelphia, Penn., has recently brought out a new fine reduction jaw crusher, No. 1030, in which the roller bearing mountings are featured.

The side plates of this crusher are of high grade carbon steel, 1¼ in. thick, and are tied together through the stationary jaw and toggle seat retainer castings, as well as by "through rods" passing all the way through the machine. The inside lining of the side plate is ¾-in. manganese steel cheek plates.

The eccnentric shaft for the moving jaw is a special steel forging and is equipped with four Timken and two S. K. F. roller bearings. It is 5⅞ in. dia. and has an eccentricity of ⅝ in. or a total throw of 1¼ in. The bearings are fitted in bushings and the whole construction is inclosed at the ends to make dirt proof and grease-leak construction.

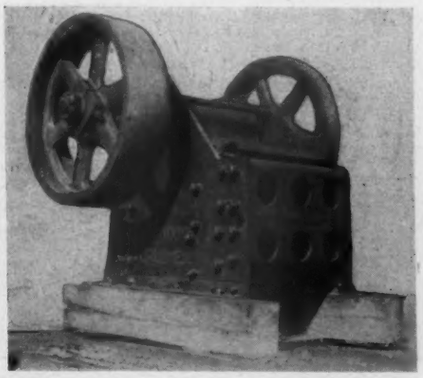
The drive pulley is 42 in. dia. by 10½ in. face. The fly wheel is the same diameter and 6¼ in. face. Both of these pulleys are keyed and have a 3-in. slotted nut with cotter pin to prevent any loose play. Split hubs facilitate the removal of the pulleys when necessary. An interesting feature of this construction is the fact that an 18 in. dia. by 8 in. face pulley may be bolted to the spokes and used for driving an elevator from the crusher shaft.

The overall width of the crusher is 5 ft. 10 in.; length, including pulleys, is 4 ft. 8 in. and height, including pulleys, is 5 ft. It is operated at a speed of 365 r.p.m. and has an approximate capacity of 25 tons per hour.

Alemite lubrication and the provisions for grease around the roller bearings, etc., are of sufficient size.

Twenty-five to 35 hp. is required to operate this unit, the difference being due to the hardness of the material being crushed.

The total weight of the crusher is approximately 9000 lb.

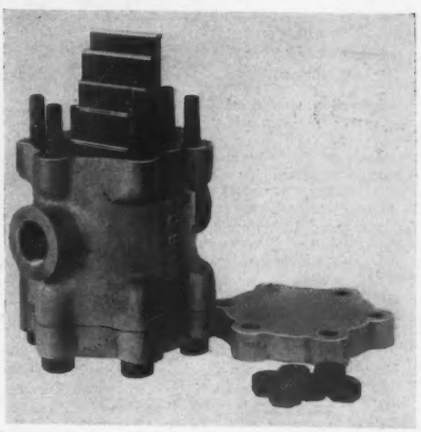


New roller-bearing jaw crusher

New Purifier for Air, Gas and Steam Lines

A NEW PURIFIER for removal or elimination of drops of liquid in air, gas and steam lines has been developed by the Andrews-Bradshaw Co., a division of the Blaw-Knox Co., Pittsburgh, Penn. The "Tracyfier," as it is called, is built for use in several sizes of lines up to 3 in. in dia.

Some of the uses for the Tracyfier in the rock products field are as follows: In steam lines to gas producers to maintain a more uniform hydrogen content in the gas; in saturated steam lines to remove moisture from the steam; in the air line for pneumatic tools to insure a supply of clean, dry air and in gas lines to remove drops of liquid.



New purifier for air, gas and steam lines

Acquire American Sales Rights for Austrian Mixed-Feed Kiln

ANNOUNCEMENT is made by the McGann Mfg. Co., York, Penn., that it has secured the American sales rights for the "Efficiency" mixed-feed lime kiln, designed and owned by E. M. Sobek, Vienna, Austria. It is said that the kiln, which is of the shaft type, has a continuous and automatic discharge and will be built in conjunction with the York kiln. It will be furnished in four sizes having rated capacities of 30, 50, 70 and 100 tons of burnt lime per 24 hours. The present hand-fired York kilns have rated capacities of 10 and 12 tons per 24 hours, and the gas-fired York kilns, 18 to 25 tons. The inside diameter of the largest size "Efficiency" kiln is 11 ft. and it is 100 ft. high.

News of All the Industry

Incorporations

Kalamazoo Haydite Tile Co., Kalamazoo, Mich., $50,000.

Arrowhead Granite Co., Inc., Hibbing, Mont., $50,000. D. Soderstrom and A. F. Anderson.

Builders and Gravel Co., Seattle, Wash., $50,000. Ray F. Wood and H. D. Maury.

Piedmont Ready Mixed Concrete Co., Charlotte, N. C., $100,000. C. A. Cochran, Charlotte, N. C.

Boonville Sand Corp., Utica, N. Y., $100,000 to $250,000.

Klass Sand and Gravel Co., Wilmington, Del., $130,000.

Williams Lime Mfg. Co., Knox county, Tenn., increased its capital stock from $100,000 to $150,000.

Anaoco Gravel Corp., De Ridder, La., $15,000. C. A. Russell, Jr., and E. W. Ogden, Montrise Bldg., Houston, Tex.

Northwest Duntile Corp., Everett, Wash., $20,000. J. W. Howell, Arthur M. Newton and others.

Knox County Gravel Co., Vincennes, Ind., $25,000. Henry E. Lane, John J. Lane and Wm. Eichel.

Bancrost Cast Stone Co., Ltd., Weston, Ont., Canada, $50,000. To manufacture artificial stone. A. J. Lequesne and others.

Moundsville Sand Co., Moundsville, W. Va., has increased its capital stock from 250 shares, par value $100, to 1000 shares, par value $100.

Westchester Block Co., White Plains, N. Y., $10,000 preferred stock and 100 shares common stock. To manufacture cement products.

Alfred-Atlas Gravel and Sand Corp., Alfred, N. Y., $16,000 and 200 shares common stock. John J. Merrill, D. S. Burdick and Ray Wingate.

Bechtel-Kaiser Rock Co., San Francisco, Calif., $500,000. R. K. Bechtel, T. M. Price, S. McWhorter, Paul S. Marvin and G. W. Sherwood, all of Oakland, Calif.

Sand and Gravel Service, Inc., New Brunswick, N. J., $50,000. Harry L. Ivins, Rariton; James W. Rea, Jr., South Amboy, and John J. Bulfin, New Brunswick.

Bailey Gravel Co., Inc., Indianapolis, Ind., $3,000. To operate a plant to dredge sand and gravel. Francis P. Bailey, E. Sommerlad and A. L. Bailey.

Lassiter-Davis Glauconite Co., Birmingham, Ala., $25,000. To develop glauconite deposits reported to run 4.32% potash. W. S. Davis, 6314 First Ave., Birmingham.

Quincy Crushed Stone Co., Boston, Mass., $50,000. President, Daniel P. Kelley; treasurer, Thos. D. Russo, 75 Bradeen St., Roslindale, and Nicholas Russo.

Durham Sand and Gravel Co., Inc., Durham, N. C., $25,000. C. E. Kimbrough and John W. Keim, of Durham, and E. J. Schabelitz, of Angier, N. C.

New England Duntile Co., Plainville, $25,000, 2500 shares $10 each. To deal in building materials. President, James A. Russell; treasurer, Francis S. Russell, 3 Fuller St., Plainville, and Mary T. Russell.

Quarries

David Herget, Dallas, Tex., is reported to be developing a limestone quarry at Sonora, Tex.

Hawkeye Quarries Co., Cedar Rapids, Iowa, is installing new crushing machinery at its plant at Glory, Iowa, near La Porte City.

Kelley Island Lime and Transport Co., Toledo, Ohio, is constructing a new 700-ft. dock at Marblehead, Ohio, for loading stone to lake freighters.

Leonard Quarry, Inc., Baltimore, Md., will develop a 20-acre quarry site, installing quarry equipment and machinery.

San Pedro, Calif. The city will open the municipal stone quarry on Catalina Island, which has been closed for some months, to meet the demand for 60,000 tons of rock needed for port construction and maintenance work.

Sand and Gravel

Beaver Sand Co., Beaver, Penn., has employed E. M. Starkweather, formerly of the Winburne Fire Brick Co., as plant superintendent.

Roquemore Gravel Co., Montgomery, Ala., is reported to have acquired additional land in Escambia county, Fla.

Indiana Gravel Co., Indianapolis, filed an amendment to its articles of incorporation increasing the number of directors to five.

Miami Gravel Co., Huntington, W. Va., has filed application for a permit to dredge sand and gravel in the Scioto river at a point 12 miles below Chillicothe, Ohio.

A. G. Erickson, Bandon, Ore., has obtained permission to set up bunkers and gravel machinery in Bandon, on the river front, to recover gravel from the river.

Fitzwater & Stone, Inc., Dayton, Ohio, have gone out of business, and the receiver, George B. Grusenmeyer, has been instructed to dispose of the firm's gravel washing plant and close up the business.

Iowa State Highway Commission is reported to be contemplating the opening of a 40-acre gravel pit at Pacific Jct., Iowa, on property owned by the state. Estimates for laying a connecting track to the C. B. & Q. R. R. have already been requested. The product is to be used in highway construction.

Tampa Sand & Gravel Co., Tampa, Fla., sustained a fire of undetermined origin on March 13 in the garage of its plant at Tampa. Seventeen of the company's trucks were destroyed in the blaze with a loss of about $60,000, while the building, which was destroyed, was valued at $5000. Explosions of gasoline in the truck tanks hindered the work of fighting the fire.

John E. Cox, Rutland, Ill., who recently became owner of the Rutland line, running between Porterfield, Ill., and Rutland, has plans for the development of sand and gravel deposits near Porterfield, according to a report in the *Winona* (Ill.) *Index*. Three old switch engines have been purchased from the Chicago and Alton R. R. and will be used in moving the material, which will be used largely in highway construction work, according to present plans.

Cement

Wolverine Portland Cement Co., Coldwater, Mich., is installing slurry filters made by the Filtration Engineers, Inc., of Newark, N. J.

Vulcanite Portland Cement Co., New York City, has leased office space in the New York Central Bldg., now under construction on Park Ave., between Forty-fifth and Forty-sixth Sts.

Florida Portland Cement Co., Tampa, Fla., has completed a sign on the roof of its plant having letters 40 ft. high. It is especially intended to be seen from the air, but is also legible from the ground.

Penn-Dixie Cement Corp., New York City, promoted J. H. Dalbey, formerly southern sales manager, to the position of assistant to the vice-president. W. Jess Brown, of the Lehigh Portland Cement Co., will assume the position of southern sales manager, to succeed Mr. Dalbey, with headquarters at Chattanooga.

Pacific Coast Portland Cement Co., Seattle, Wash., has appointed Darwin Meisnest assistant sales manager under Wylie Hemphill, general sales manager. Mr. Meisnest since his graduation from the University of Washington in 1919 has been graduate manager of the Associated Students of the University of Washington, and has been in charge of the university's million and a half dollar building program, including the half million dollar stadium.

Cement Products

Renton Cement Products Co., Renton, Wash., sustained a fire of unknown origin at its plant on March 5, which caused about $5000 damage.

Herman Regier, Ulysses, Kan., has leased the idle cement block plant of the Consumers Sand Co. in Wichita, Kan., and will start the manufacture of I-shaped block and other cement products.

St. Louis, Mo. Building Commissioner Christopher recently authorized the use of concrete and cinder building blocks for houses up to two and one-half floors high.

Ohio Concrete Burial Vault Association has been organized by Ohio manufacturers of concrete vaults. H. A. Ledyard, Ashland, Ohio, was elected president; Louis O'Connell, Tiffin, vice-president, and J. H. Stuart, Bremen, secretary-treasurer.

Wheeling Patent Block Co., Wheeling, W. Va., is planning to begin the manufacture of Shope concrete brick in a short time, having acquired the rights for the territory near Wheeling from D. F. Shope.

United Concrete Pipe and Construction Co., Merced, Calif., has purchased a 3-acre tract of land on the S. P. R. R. at Tracy, Calif., on which to establish another products plant. The company now operates plants at Merced, Woodland and Delhi, Calif.

Lime

Washington Building Lime Co., Engle, W. Va., is erecting a 120-ton Schulthess hydrating plant.

Eagle Rock Lime Co., Eagle Rock, Va., is planning the installation of additional crushing and other machinery.

Salem Lime and Stone Co., Salem, Ind., is installing a new 50-ton Schulthess hydrating plant, and will erect another kiln at its plant.

B. L. John, Portland, Ore., is constructing a five-kiln lime plant on Williams Creek, in the lower Applegate valley in Oregon, according to a report in the *Medford* (Ore.) *Mail-Tribune*. The cost will be approximately $75,000.

Saginaw Lime and Stone Co., Saginaw, Ala., has obtained the hydrating plant of the Long View Lime Works, Long View, Ala., and is moving it to Saginaw, where it will be rebuilt as a part of the Saginaw plant. Two York gas-fired kilns will be added to the present battery of four kilns, and a 90-ton Schulthess hydrate plant will also be added.

Gypsum

United States Gypsum Co., Chicago, Ill., is contemplating the construction of a plant at St. Petersburg, Fla., having a capacity of 500 tons of ground gypsum daily.

Victor Plaster Co., Victor, N. Y., is reported to be planning the construction of a gypsum plant at Victor. A. H. Dewey, 16 W. Main St., Rochester, N. Y., is secretary and treasurer of the company.

Miscellaneous Rock Products

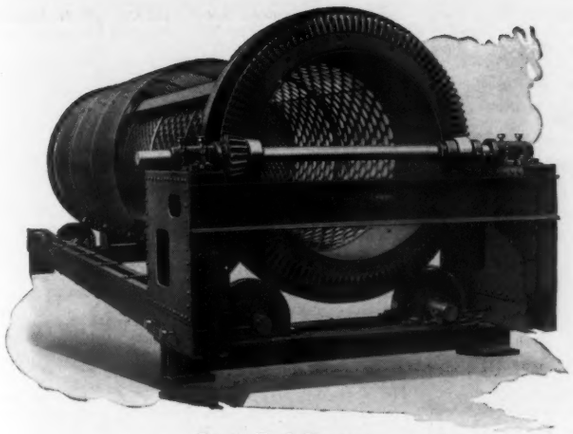
Southern Manganese Corp., Anniston, Ala., has let contracts for the erection of a new tri-sodium phosphate plant.

Uvalde Rock Asphalt Co., Beaumont, Tex., has amended its incorporation papers changing its place of business to San Antonio, Tex.

British Columbia Refractories, Ltd., Vancouver, B. C., has awarded contracts for the erection of a new plant on False creek to cost about $45,000. The company is contemplating developing extensive deposits of diatomaceous earth near Quesnal, B. C.

J. A. Martin, Marble, Tenn., is reported to have acquired the equipment of the Regal Blue Marble Co., which will be moved to his present operation, where a pulverizing plant for the manufacture of metallic magnesium from marble is now being erected. The plant will have a capacity of 150 tons per day.

Alabama Rock Asphalt, Inc., Birmingham, Ala., has elected Wallace L. Caldwell president. Mr. Caldwell was formerly president of the Kentucky Rock Asphalt Co., Kyrock, Ky. J. H. Conzelman, for the past three years chief engineer of the National Rock Asphalt Corp., Louisville, Ky., has been appointed chief engineer of the Alabama company.



Open End Screen

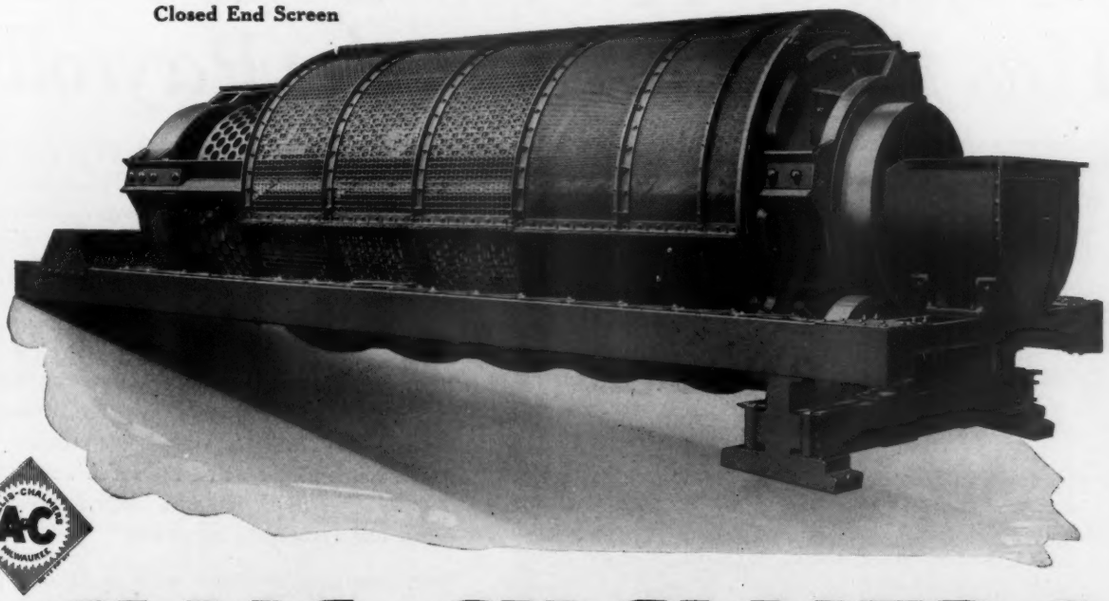
Consumers Good-Will

THE goal of all producers, whether it be the producer of commercial aggregate or the manufacturer of machinery. The commercial aggregate producer is constantly striving to produce clean accurately sized aggregate of the proper screen analysis to meet specifications and hold the good will of their customers, all of which is governed by the proper application and selection of crushing and screening equipment.

Allis-Chalmers throughout its years of serving the aggregate producer has maintained good will by its high standard of quality and its diversified line of equipment together with the proper application of its products to the producers' problems.

The Allis-Chalmers' line of sizing equipment includes closed end revolving screens built in various standard sizes from 24″ to 72″ in diameter and open end screens in standard sizes 48″ to 84″ in diameter, also roller grizzleys, all of which insures the purchaser of sizing equipment an unbiased recommendation based on his particular problem.

Closed End Screen



ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

Personals

E. O. Johnstone, district sales manager for the American Chain Co., Inc., San Francisco, Calif., has been appointed Pacific Coast distributor of Ford chain hoists to the industrial trade.

W. S. Hovey, president of Fairbanks, Morse & Co., recently spoke to the Chicago section of the American Society of Mechanical Engineers on "The Engineer's Part in Business."

Lorimer Dunlevy, formerly sales manager of the Climax Engineering Co., Clinton, Iowa, has resigned that position to become general sales manager for the O. E. Szekely Co., of Holland, Mich., makers of airplane engines and other products.

Leo W. Koenigsacker, Davenport, Iowa, has resigned from his position as sales manager for the Linwood Stone and Cement Co., of Davenport, and has assumed the management of the W. G. Block Co., of Clinton, Iowa, dealer in fuel and building supplies.

Myron F. Westover, secretary of the General Electric Co. for the past 34 years, retired on March 1 and William W. Trench, assistant secretary, has been elected by the board of directors to succeed him. Mr. Westover has been actively identified with the electrical industry for 40 years, his first position being secretary to the late Charles A. Coffin, then treasurer and manager of the Thomson-Houston Electric Co.

Obituaries

T. W. McGrahan, secretary and treasurer of the Texas Cement Plaster Co., of Oklahoma City, Okla., died on February 13, following a brief illness.

Lute E. Foster, chief chemist of the Volunteer Portland Cement Co., Knoxville, Tenn., died at Edgehill, Tenn., on February 13. He had joined the Volunteer organization only a short time before his death.

G. O. Curtis, chief purchasing agent of the International Cement Corp., New York City, died on March 5 at the Knickerbocker Hospital in New York, following an illness of three weeks. Mr. Curtis, who has been identified with the cement industry for 28 years, was 53 years old.

Manufacturers

Byers Machine Co., Ravenna, Ohio, announces that H. C. Beckwith has returned to the company as president and general manager, after having been absent from the company since 1926, when he retired.

Lincoln Electric Co., Cleveland, Ohio, has recently organized and re-equipped its school for training electric arc welders. The present course given to the students requires 30 days, and includes practical training to familiarize them with welding machines and welding practice.

M. W. Kellogg Co., New York City, has developed a new line of fireproof cement for furnace work and boiler settings, according to reports. The new product, which is known as "Ignisite," is described as a ready-prepared, plastic refractory and binder.

Magnetic Mfg. Co., Milwaukee, Wis., has appointed T. F. Scannell as its exclusive representative in the St. Louis territory, with offices in the Ambassador Bldg., St. Louis. Mr. Scannell was formerly connected with the Chain Belt Co. of Milwaukee.

Perfex Corp., Milwaukee, Wis., announces the opening of an office in Cleveland in the Leader Bldg. A. C. Owen, formerly located at New York, will be in charge of the office, taking over the Ohio territory in addition to the eastern states, which he formerly covered.

The General Electric Co., Schenectady, N. Y., awarded $51,567 to 4913 of its employes during 1927 for their suggestions tending to improve working conditions or increase the efficiency of the company's operations. During the year 15,059 suggestions were offered, an increase of 500 over the previous year, and more than 32% were accepted.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., announces the appointment of R. T. Stafford, formerly district manager of the Seattle office, as assistant manager of the electrical department in charge of sales and engineering at the Pittsburgh Transformer Works. John Alberts has been appointed district manager to succeed Mr. Stafford. It is also announced that E. D. Hill will be located at 42 Church St., New Haven, Conn., to serve that community.

McGann Mfg. Co., York, Penn., have shipped what is claimed to be the world's largest coal dryer to the Bermind Fuel Co., Superior, Wis. The dryer is 105½ in. in diameter and 65 ft. in length. Another large dryer 94 ft. in diameter and 45 ft. long was recently shipped to the Limedale, Ind., plant of the International Cement Co. An 80-in. by 45-ft. dryer is being shipped to the Pacific Coast Cement Co., Seattle, and a 90-in. by 55-ft. dryer to the National Cement Co., Ltd., Montreal, Canada.

Trade Literature

***NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention* ROCK PRODUCTS.**

Electric Hoist Catalog. Illustrated Bulletin No. 31, furnishing data and diagrams, and including useful information concerning electric hoists and their installation. CHISHOLM-MOORE MFG. CO., Cleveland, Ohio.

Lincoln Motors. 26-page illustrated booklet describing types of "Linc-Weld" motors and showing advantages. **Supplies for Welders.** Illustrated bulletin of supplies and equipment for "Stable Arc" welders. LINCOLN ELECTRIC CO., Cleveland, Ohio.

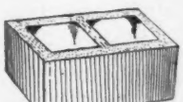
Polyphase Induction Motors. Bulletin No. 1118-E, fully illustrated with views and drawings of squirrel cage and slip ring type general purpose motors. ALLIS-CHALMERS CO., Milwaukee, Wis.

Industrial Electric Heating. An article from the "General Electric Review" dealing with the technical development of electrical heating for melting non-ferrous metals. **Review of the Development of Direct-Current Motor Design.** An article from the "General Electric Review" by Prof. Elihu Thompson on design of motors. **GEA-887.** Bulletin on drum controllers for motors used on crane hoists and similar applications. **GEA-712A.** Type BTA motors for alternating current and adjustable speed use. **GEA-930.** Pot-type electric furnaces for lead hardening at temperatures up to 1650 deg. F. GENERAL ELECTRIC CO., Schenectady, N. Y.

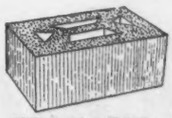
The quotation reproduced is from an address by W. D. M. Allan, of the Cement Products Bureau, Portland Cement Association, made before the National Sand and Gravel Assn. convention in Detroit, January 6, 1928.

...struction.

The use of 5x8x12-in. tile is increasing more rapidly than any other product in the concrete masonry field. These tile weigh from 16 to 18 lbs. and brick masons like to handle them because they are designed with hand-holes for convenience and the mortar beds are wide. These tile are particularly adaptable for back-up in bearing walls and in structural frames. The 5-in. height makes bonding with brick every six or seven courses very si...



2-Core Tile



"High-Test" Tile

Building Tile

—a rapidly growing outlet for concrete aggregate

Consider these four facts:

1. The use of concrete masonry units has increased 700% since the war.

2. The concrete products industry used over five million cubic yards of aggregates in 1927.

3. Of all types of masonry units—blocks, brick and tile—the concrete tile shows the most rapid increase in demand.

4. While the concrete products industry has suddenly grown in importance as a customer of your plant, many producers of sand, gravel and crushed stone have taken the logical step of establishing concrete products plants of their own.

Now—the company signing this advertisement is the largest manufacturer of concrete products plant equipment in the world. We offer a complete line of machinery for the manufacture of block, brick and tile. We offer the most complete line of tile machines available anywhere. We do more than sell machinery—we place at your disposal an engineering service that will help you determine your market, lay out your plant and put it into successful operation.

Write us for information on concrete building tile manufacture

Consolidated
Concrete Machinery Corpn.
UNIVERSAL ANCHOR
ADRIAN, MICHIGAN

STREET CABLEWAY CARRIAGE — extreme simplicity and many exclusive features make this Carriage an important feature of Street Cableways.

STREET SLACKLINE BUCKET—a real digging bucket with back dump, and pull in front of digging blade. Has many exclusive advantages.

STREET EXCAVATOR HOIST — built for strength and dependability under the most adverse conditions. Easy to operate and control.

Street Slackline Excavators embrace many exclusive features and improvements developed under actual operating conditions.

Correct Design

Characterize All

Street Products

Street Slack Cable Excavators and all Street products, embrace many notable features, perfected and used exclusively by Street engineers, which add tremendously to efficiency of operation, low up-keep cost, and long life of the equipment.

In addition to superiority of design, Street products represent the latest and most improved methods of construction. All materials are of the highest quality, each tested most rigidly to assure maximum strength and wearing qualities —no tied-up jobs through breakage when you use Street equipment.

Street products are chosen for the most difficult work by leading engineers and contractors. We will be glad to tell you about any Street product and to refer you to satisfied Street users in all parts of the country. Write us today, stating your requirements.

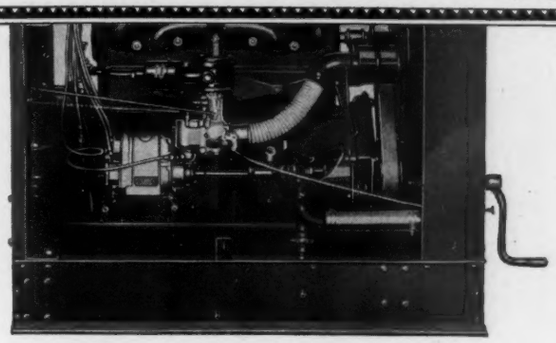
Street Bros. Machine Works
(Incorporated)
Chattanooga, Tennessee.

STREET

Slackline Excavators-Hoists Cableways-Derricks

"ALWAYS GIVE SATISFACTION"

Ungoverned power destroys even the most rugged machine



The Continental
Power Unit Is
PIERCE Protected

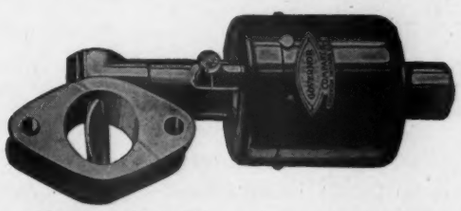
Turning Abused Power Into *Used* Power

Every time a power engine races or stalls when loads are suddenly released or applied—***power is wasted.*** And wasted power is wasted profit!

By the simple addition of a PIERCE GOVERNOR your power engines are equipped to deliver a uniform, steady flow of power that prevents racing, stalling and vibration, no matter how sudden or wide the load variation.

This protection means 200% to 400% longer life for your power engines and guards every moving part against excess wear. It means higher efficiency, lower operating and fuel costs, fewer repair bills, and more days on the job every month.

Power protection is profit protection! Every engine you operate should be equipped with a PIERCE GOVERNOR.



PIERCE GOVERNORS are used as standard equipment by more than 350 manufacturers of power equipment. Follow their example—and you'll increase your profits.

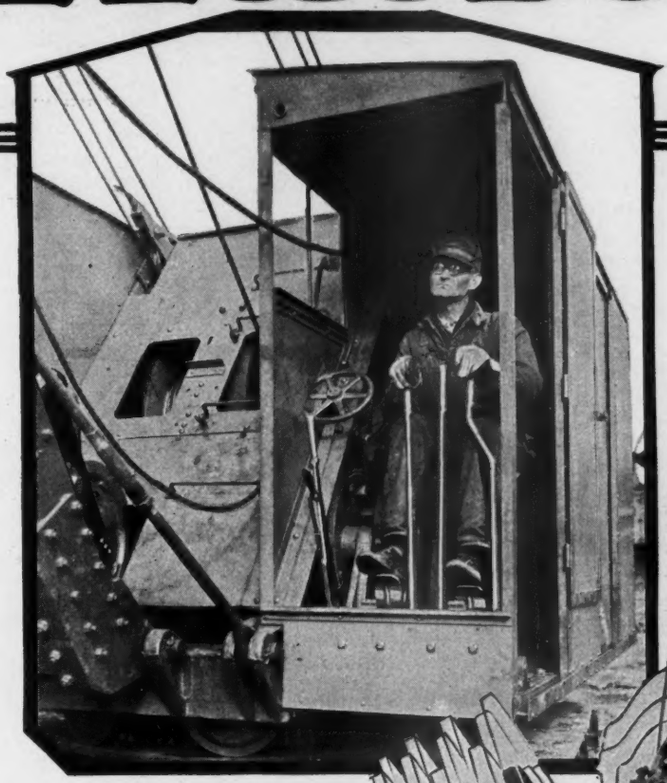
Get the facts today — learn how abused power may be turned into used power at a real saving. Send for your copy of our booklet No. 120.

PIERCE GOVERNOR CO., Anderson, Ind.
"World's Largest Governor Builders"

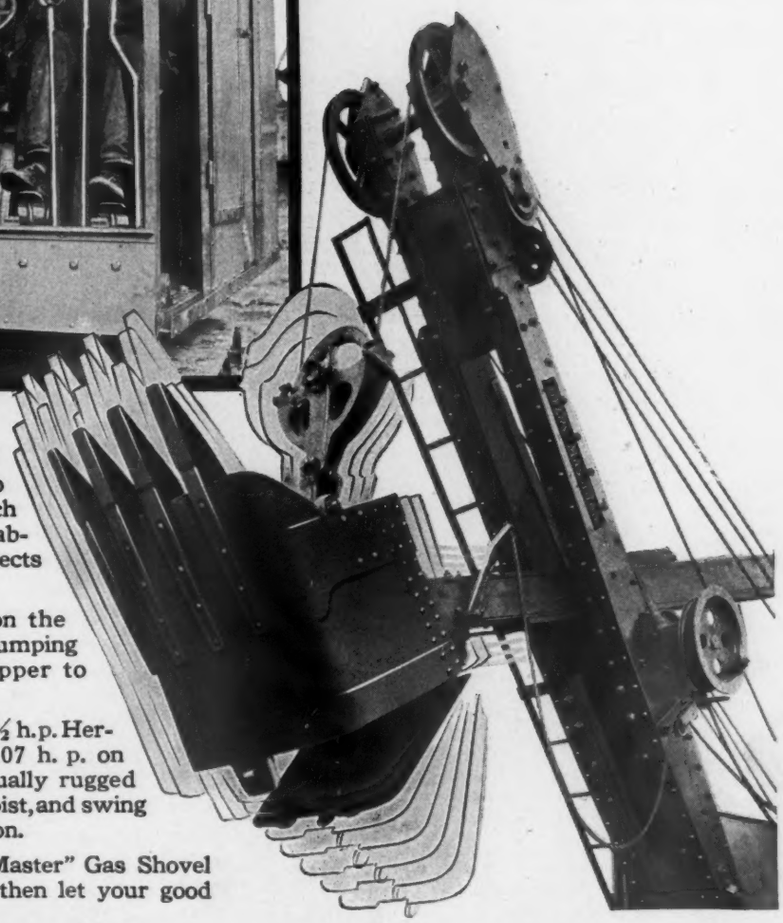
Pierce Governors *for Automatic Speed Control*

When writing advertisers, please mention ROCK PRODUCTS

FLEXIBILITY



BYERS-MASSILLON B.M CRANES SHOVELS



FLEXIBILITY of control equal to that of a steam shovel enables the operator of the "Master" Gas to shake the dipper at will with a touch of the lever. The patented shock absorber at the base of the boom protects the cables from shock strain.

This independent cable crowd on the "Master" Shovel not only helps in dumping sticky material, but enables the dipper to hold a level grade in digging.

Extraordinary speed and power (90½ h.p. Hercules Engine on the 1 yd. machine, 107 h. p. on the 1¼ yd.) are backed up by unusually rugged construction. Direct drive to crowd, hoist, and swing insures ample power for each operation.

We want you to compare the "Master" Gas Shovel on every point with other machines, then let your good judgment decide.

Wire or send the coupon for full information.

THE BYERS MACHINE COMPANY, Ravenna, Ohio

Sales and Service Throughout the Country

Builders of the Bear Cat, ½ yard; the Bear Cat "Whirly," ¾ yard; the "Master" Shovels, 1 and 1¼ yards; and Massillon Steam Shovels.

BYERS Master Shovels

THE BYERS MACHINE CO., Ravenna, Ohio
Send the Booklets checked so that we may become further acquainted with The Great Byers Line.

- ☐ Byers Master Shovels, 1 and 1¼ yards.
- ☐ Byers Bear Cat, ½ yard, half-circle.
- ☐ Byers Bear Cat "Whirly," ¾ yd., full-revolving

Signed_____
Firm _____
Address_____
City_____ State_____

RP. 8-17-28

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 160

Acetylene Generating Apparatus
Linde Air Products Co.
Oxweld Acetylene Co.

Adamite (Castings)
Mackintosh-Hemphill Co.

Aerial Wire Rope Tramways
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.

Agitators, Thickeners and Slurry Mixers
The Dorr Co.
Hardinge Co.
Hetherington & Berner, Inc.
Manitowoc Engineering Works
Polysius Corp.
F. L. Smidth & Co.

Air Compressors
Pennsylvania Pump & Compressor Co.
Sullivan Machinery Co.
Traylor Eng. & Mfg. Co.

Air Filters
Dust Recovering & Conv. Co.

Air Pumps
Fuller Lehigh Co.

Air Separators
Dust Recovering & Conv. Co.
Rubert M. Gay Co., Inc.
Hardinge Co.
Kent Mill Co.
New Haven Sand Blast Co.
Raymond Bros. Impact Pulv. Co.
W. W. Sly Mfg. Co.
Sturtevant Mill Co.
Universal Road Machinery Co.

Ash and Refuse Handling Equipment
Hayward Co.

Automatic Weighers
Merrick Scale Mfg. Co.

Axles
Bethlehem Steel Co.

Backfillers
Bucyrus-Erie Co.

Bags
Bemis Bro. Bag Co.
Jaite Co.

Bagging Machinery
Bemis Bro. Bag Co.

Balls (Tube Mill, etc.)
Allis-Chalmers Mfg. Co.
Fuller Lehigh Co.
Manganese Steel Forge Co.
Manitowoc Engineering Works
Polysius Corporation
W. A. Riddell Co.
F. L. Smidth & Co.
Sturtevant Mill Co.

Bar Benders and Cutters
Koehring Co.

Batchers
Blaw-Knox Co.

Bearings
Chain Belt Co.
Hyatt Roller Bearing Co.
Webster Mfg. Co.

Bearings (Anti-Friction)
Hyatt Roller Bearing Co.

Bearings (Collar Oiling)
Hyatt Roller Bearing Co.

Bearings (Tapered Roller)
Hyatt Roller Bearing Co.

Bearings (Thrust)
Hyatt Roller Bearing Co.

Belting
B. F. Goodrich Rubber Co.
Goodyear Tire & Rubber Co.
Robins Conveying Belt Co.
F. M. Welch Eng. Serv.

Bins (Cement, etc.)
Blaw-Knox Co.
Burrell Eng. & Const. Co.
Galland-Henning Mfg. Co.
Hetherington & Berner, Inc.
Manitowoc Engineering Works
Traylor Eng. & Mfg. Co.
Universal Crusher Co.
Webster Mfg. Co.

Bin Gates
Austin Mfg. Co.
R. H. Beaumont Co.
Easton Car & Construction Co.
Fuller Lehigh Co.
Galland-Henning Mfg. Co.
Gruendler Patent Crusher & Pulverizer Co.
Industrial Brownhoist Corp.
Link-Belt Co.
Manitowoc Engineering Works
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.

Blast Hole Drills (See Drills)

Blasting Machines
Hercules Powder Co.

Blasting Supplies
Hercules Powder Co.

Block Machines (Concrete)
Consolidated Concrete Machinery Corp.
W. A. Riddell Co.

Blocks (Pillow)
Hyatt Roller Bearing Co.

Blocks (Sheave)
R. H. Beaumont Co.
Dobbie Foundry & Machine Co.
Sauerman Bros.

Blowers
Northern Blower Co.

Blowpipes
Linde Air Products Co.
Oxweld Acetylene Co.

Bodies (Motor Truck)
Easton Car & Construction Co.

Brick Hardening Cylinders
Komnick Machinery Co., Inc.

Brick (Insulating)
General Refractories Co.

Brick Loading Apparatus
Komnick Machy. Co.

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Jackson & Church Co.
Komnick Machinery Co., Inc.
W. A. Riddell Co.

Bucket Conveyors (See Conveyors and Elevators)

Buckets (Dragline and Slackline)
R. H. Beaumont Co.
Page Engineering Co.
Sauerman Bros.
Street Bros. Mch. Wks., Inc.

Buckets (Elevator and Conveyor)
Chain Belt Co.
Galland-Henning Mfg. Co.
Gruendler Patent Crusher & Pulverizer Co.
Hayward Co.
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Link-Belt Co.
Manganese Steel Forge Co.
Polysius Corporation
Robins Conveying Belt Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
W. Toepfer & Sons Co.
Webster Mfg. Co.

Buckets (Grab, Clamshell, etc.)
Blaw-Knox Co.
Browning Crane Co.
Hayward Co.
Industrial Brownhoist Corp.
Link-Belt Co.
Owen Bucket Co.
Page Engineering Co.

Buhr Mills
J. B. Ehrsam & Sons Mfg. Co.
Sturtevant Mill Co.

Buildings
Blaw-Knox Co.
H. K. Ferguson Co.

Cableways
R. H. Beaumont Co.
Broderick & Bascom Rope Co.
Dobbie Foundry & Machine Co.
S. Flory Mfg. Co.
Hayward Co.
Interstate Equipment Corp.
Link-Belt Co.
Mundy Sales Corp.
Page Engineering Co.
Sauerman Bros.
Street Bros. Machine Wks.

Calcining Kettles (Gypsum)
Butterworth & Lowe
J. B. Ehrsam & Sons Mfg. Co.

Caps (Blasting, Electric & Delay Electric)
Hercules Powder Co.

Car Pullers
Bethlehem Steel Co.
Dobbie Foundry & Machine Co.
Mundy Sales Corp.
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.

Carriers
Stephens-Adamson Mfg. Co.

Cars (Dump)
Austin Mfg. Co.
Easton Car & Construction Co.
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Bethlehem Steel Co.
Consolidated Concrete Machinery Corp.
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Castings
Bethlehem Steel Co.
Fuller Lehigh Co.
Hetherington & Berner, Inc.
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Cement (High Temperature)
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Chain (Dredge and Steam Shovel)
Bucyrus-Erie Co.
Jeffrey Mfg. Co.
Manganese Steel Forge Co.

Chain (Elevating and Conveying)
Chain Belt Co.
Philadelphia Gear Works
Stephens-Adamson Mfg. Co.
Webster Mfg. Co.

Chain Drives
Chain Belt Co.
Link-Belt Co.

Chain Links (Cold Sheet, Repair, etc.)
Bucyrus-Erie Co.

Chemists
Robert W. Hunt Co.

Chutes and Chute Liners
Mackintosh-Hemphill Co.
F. L. Smidth & Co.
Webster Mfg. Co.

Clamshell Buckets—See Buckets (Grab, Clamshell, etc.)

Clamshell Cranes (See Cranes)

Clarifiers
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Classifiers
The Dorr Co.

Clay Working Machinery
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Clips (Wire Rope)
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Clutches
Fairbanks, Morse & Co.

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Coal Pulverizing Equipment
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Vulcan Iron Works

Cocks (Lubricated-Acid-Proof)
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Compressors
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Fairbanks, Morse & Co.

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Chain Belt Co.
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Hayward Co.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Link-Belt Co.
Manganese Steel Forge Co.
Polysius Corporation
Robins Conveying Belt Co.
F. L. Smidth & Co.

Giant Crushing Power

TRAYLOR

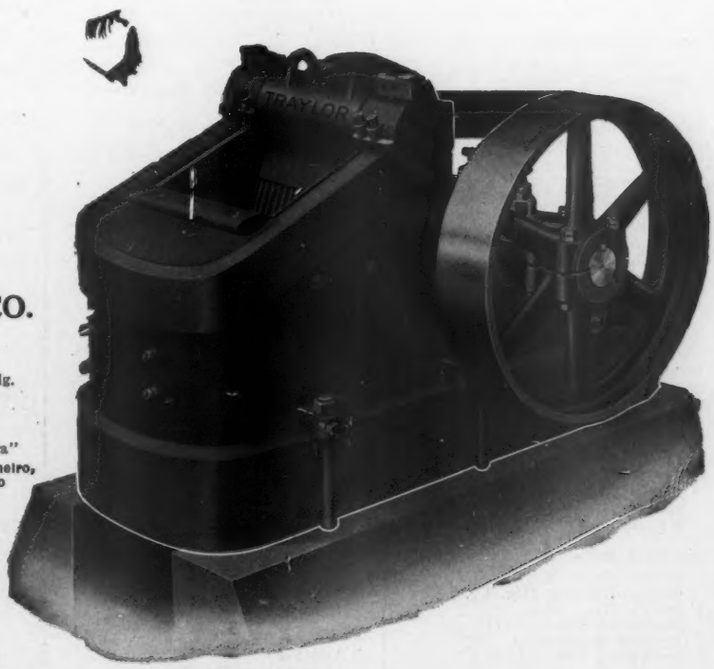
Bulldog Jaw Crusher

NO crushing job is too tough for the Traylor Bulldog to conquer! Over one hundred of these machines are in constant use in different parts of the world—and in all instances they are measuring up in every way to everything that might reasonably be expected of a primary breaker.

Built in a wide range of sizes up to 48″ x 60″, there is a Bulldog Jaw Crusher perfectly adapted to meet the primary crusher needs for plants of all capacities, or requirements.

The SAVING OF POWER and REDUCTION OF MAINTENANCE COSTS brought about by the design of the Pitman, Toggle System and Eccentric shaft bearings, through the elimination of weight and friction, are some of the outstanding features that characterize the Bulldog as the most advanced jaw crusher of the day.

Bulletin No. 1099 gives complete details. Send for it.



TRAYLOR ENGINEERING AND MFG. CO.
Allentown, Penna.

NEW YORK 30 Church St. | CHICAGO 1414 Fisher Bldg. | LOS ANGELES 362 I. W. Hellman Bldg.
SALT LAKE CITY 100 W. 2nd South St. | SEATTLE 815 Alaska Bldg.
TIMMINS, ONTARIO, CANADA, Moore Block
Export Department, 104 Pearl St., New York City—Cable Address: "Forsaltra"
Foreign Sales Agencies: London, Rangoon, Johannesburg, Lima, Rio de Janeiro, Sao Paulo, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro
European Works—Usines Carels Freres, Ghent, Belgium

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Goodyear Tire & Rubber Co., Inc.

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Byers Machine Co.
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Cranes (Overhead, Traveling, Electric, etc.)
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Crusher Protectors
Magnetic Mfg. Co.

Crushers (Hammer)
Dixie Machinery Mfg. Co.
Pennsylvania Crusher Co.
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Crushers (Jaw and Gyratory)
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Austin Mfg. Co.
Butterworth & Lowe
Galland-Henning Mfg. Co.
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Mackintosh-Hemphill Co.
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Universal Crusher Co.
Universal Road Machy. Co.

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J. B. Ehrsam & Sons Mfg. Co.
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Traylor Eng. & Mfg. Co.

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Oxweld Acetylene Co.

Decarborizing Apparatus
Linde Air Products Co.

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Street Bros. Machine Wks.

Detonators
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Insley Mfg. Co.

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Harnischfeger Corp. (Pawling & Harnischfeger)
Insley Mfg. Co.
Koehring Co.
Link-Belt Co.
Monighan Machine Co.
Page Engineering Co.
Thew Shovel Co.

Dragline Excavators
Hayward Co.
Monighan Machine Co.
Page Engineering Co.
Thew Shovel Co. (Electric, Gasoline & Steam)

Dragline Cableway Excavators
R. H. Beaumont Co.
Browning Crane Co.
Bucyrus-Erie Co.
Dobbie Foundry & Machine Co.
Link-Belt Co.
Mundy Sales Corp.
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Hayward Co.
Hetherington & Berner, Inc.
Mundy Sales Corp.
F. M. Welch Eng. Serv.

Drill Sharpening Machines
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Sullivan Machinery Co.

Drill Steel
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Drilling Accessories
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Drills (Blast Hole)
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Loomis Machine Co.

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Sullivan Machinery Co.

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Drives (See Gears, Chain Drives, etc.)

Drives (Worm)
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Drums (Magnetic)
Magnetic Mfg. Co.

Dryers
Allis-Chalmers Mfg. Co.
Bonnot Co.
Fuller Lehigh Co.
Galland-Henning Mfg. Co.
McGann Mfg. Co., Inc.
Manitowoc Engineering Works
Polysius Corporation
Raymond Bros. Impact Pulv. Co.
W. A. Riddell Co.
Ruggles-Coles Div. of Hardinge Co., Inc.
Traylor Eng. & Mfg. Co.

Dust Arresters
Dust Recovering & Conv. Co.
New Haven Sand Blast Co.
Northern Blower Co.
Pangborn Corp.
W. W. Sly Mfg. Co.

Dust Blowers
Dust Recovering & Conv. Co.

Dust Collecting Systems
Allis-Chalmers Mfg. Co.
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New Haven Sand Blast Co.
Pangborn Corp.
Polysius Corporation
W. W. Sly Mfg. Co.

Dust Conveying Systems
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Fuller Co.

Dynamite
Hercules Powder Co.

Electric Power Equipment
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.

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Elevator Buckets (See Buckets—Elevator)

Elevators (See Conveyors and Elevators)

Emery Mills
Sturtevant Mill Co.

Engineers
Bonnot Co.
Burrell Eng. & Const. Co.
The Dorr Co.
Dust Recover'g & Conveying Co.
H. K. Ferguson Co.
Fuller Lehigh Co.
Hetherington & Berner, Inc.
Robt. W. Hunt Co.
Kritzer Co.
E. J. Longyear Co.
Manitowoc Engineering Works
H. Miscampbell
F. L. Smidth & Co.
Sturtevant Mill Co.
Webster Mfg. Co.
F. M. Welch Eng. Serv.
R. D. Wood & Co.

Engine Governors
Pierce Governor Co.

Engines (Diesel)
Bethlehem Steel Co.
Fairbanks, Morse & Co.
Power Mfg. Co.

Engines (Gasoline, Kerosene and Oil)
Buda Co.
Climax Engineering Co.
Dobbie Foundry & Machine Co.
Fairbanks, Morse & Co.
Hercules Motors Corp.
Mundy Sales Corp.
Power Mfg. Co.
Wisconsin Motor Mfg. Co.

Engines (Steam)
Dobbie Foundry & Machine Co.
Mundy Sales Corp.

Excavating Machinery (See Shovels, Cranes, Buckets, etc.)

Explosives
Hercules Powder Co.

Fans (Exhaust)
Jeffrey Mfg. Co.
New Haven Sand Blast Co.
W. W. Sly Mfg. Co.

Feeders
Robins Conveying Belt Co.

Filters (Air)
Dust Recovering & Conv. Co.

Fire Brick
General Refractories Co.

Flux
Oxweld Acetylene Co.

Forgings
Manganese Steel Forge Co.

Frogs and Switches
Bethlehem Steel Co.
Easton Car & Construction Co
L. B. Foster Co.
Morrison & Risman Co., Inc.

Furnaces
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Sullivan Machinery Co.

Gaskets
B. F. Goodrich Rubber Co.
Goodyear Tire & Rubber Co., Inc.

Gasoline Engines—(See Engines, Gasoline, Kerosene and Oil)

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Gas Producers
R. D. Wood & Co.

Gauges
Linde Air Products Co.
Oxweld Acetylene Co.

Gears (Spur, Helical, Worm)
Cleveland Worm & Gear Co.
Horsburgh & Scott Co.
Jeffrey Mfg. Co.
Philadelphia Gear Works

Gears and Pinions
Chain Belt Co.
Horsburgh & Scott Co.
Mackintosh-Hemphill Co.
Philadelphia Gear Works
Stephens-Adamson Mfg. Co.
Vulcan Iron Works

Gear Reducers
Cleveland Worm & Gear Co.
Horsburgh & Scott Co.
Philadelphia Gear Works

Generators (See Motors and Generators)

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF FLORIDA

Bankruptcy Sale!

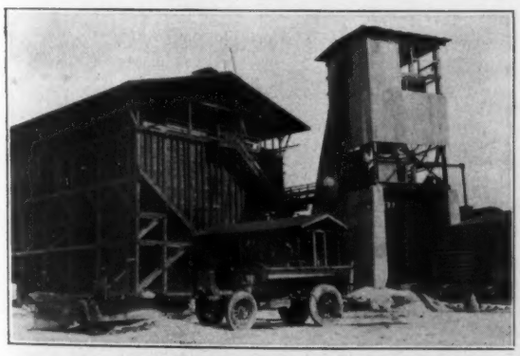
General view of the plant of Florida Rock Products Co., Brooksville, Fla. The Amiesite plant is at the left and is connected by conveyor with crushing plant at right

Florida Rock Products Co.

Crushed Stone and Amiesite Plant

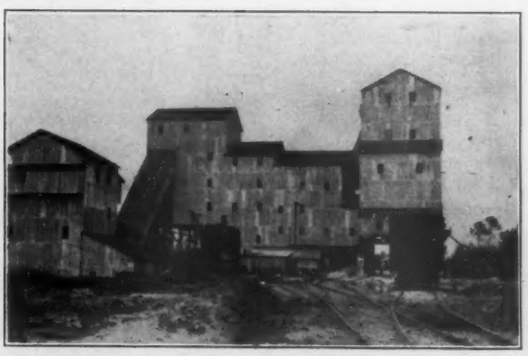
To be Sold as a Complete Unit

Petition filed in bankruptcy has necessitated offering for sale by the trustee, on the 20th of April at 10:00 o'clock in the forenoon at the office of Hon. H. P. Baya, Referee in Bankruptcy, Tampa, Fla., the property and plant of the Florida Rock Products Co., Bankrupt, located in Hernando County, one mile out of Brooksville, Florida. This plant is located in the region where Tampa limestone occurs—the only limestone formation in the state suitable for producing a commercial crushed stone similar to that produced generally throughout the United States. The plant is modern and complete in all details, and is favorably located as regards labor and transportation facilities.



End of Amiesite plant showing elevator loading material for shipment

The property, plant and all assets with complete quarry equipment, is offered for sale subject to confirmation by Referee. For crushed stone producers interested in expanding their activities, this is a rare opportunity to acquire a plant at a real bargain as appraisement of assets is only 15 per cent of the assets as listed in the bankruptcy schedule. Inquiries are respectfully solicited.



General view of the crushing plant

Address inquiries to

L. L. BUCHANAN, Trustee

1201-2 Wallace S. Building **Tampa, Florida**

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Oxweld Acetylene Co.

Gloves (Asbestos)
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Oxweld Acetylene Co.

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Grab Bucket Hoists (Monorail) (See Cranes)

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Joseph Dixon Crucible Co.

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Acheson Graphite Co.

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Grating
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Grinding Balls
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Stephens-Adamson Mfg. Co.
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Smith Engineering Works
Street Bros. Machine Wks.
Sullivan Machinery Co. (Portable Air, Electric and Steam)
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Kiln Insulation
General Refractories Co.

Kiln Liners
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Blaw-Knox Co.
Bonnot Co.
Hardinge Co.
Manitowoc Engineering Works
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Polysius Corporation
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.
Vulcan Iron Works

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H. Miscampbell
Vulcan Iron Works

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Philadelphia Gear Works

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B. F. Goodrich Rubber Co.

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Jeffrey Mfg. Co.

Lubricants
Acheson Graphite Co.
Broderick & Bascom Rope Co. (Wire Rope)
Joseph Dixon Crucible Co.
Merco Nordstrom Valve Co. (Valve)
Troco Lubricating Co.

Machinery Guards
Harrington & King Perforating Co.

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Eisemann Magneto Corp.

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Manganese Steel Forge Co.

Mechanical Rubber Goods
B. F. Goodrich Rubber Co.

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Mills, Grinding (Ball, Tube, etc.) (See also Crushers, Hammer)
Allis-Chalmers Mfg. Co.
Bethlehem Steel Co.
Bonnot Co.
Bradley Pulverizer Co.
Fuller Lehigh Co.
Hardinge Co.
Jackson & Church Co.
Mackintosh-Hemphill Co.
Polysius Corporation
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
Fuller Lehigh Co.
Jeffrey Mfg. Co.
F. L. Smidth & Co.

Mill Lining (Rubber for Ball and Tube Mills)
B. F. Goodrich Rubber Co.

Mine Development
E. J. Longyear Co.

Mining Engineers (See Engineers)

Molds (Concrete)
Consolidated Concrete Machinery Corp.

Motors (Gasoline)
Climax Engineering Co.

Motors and Generators (Electric)
Allis-Chalmers Mfg. Co.
Fairbanks, Morse & Co.

Nitrogen
Linde Air Products Co.

Oil Burning Apparatus
Raymond Bros. Impact Pulv. Co.

Ore Jigs
McLanahan-Stone Machine Co.

Oxy-Acetylene Apparatus
Linde Air Products Co.
Oxweld Acetylene Co.

Oxygen Gas
Linde Air Products Co.

Packings (Pump, Valve, etc.)
B. F. Goodrich Rubber Co.
Goodyear Tire & Rubber Co., Inc.

Paint
Joseph Dixon Crucible Co.

Pavers
Koehring Co.

Perforated Metal
Chicago Perforating Co.
Cross Engineering Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.
W. Toepfer & Sons Co.

Pile Drivers
Browning Crane Co.
Bucyrus-Erie Co.
Harnischfeger Corp. (Pawling & Harnischfeger)

Pins and Bushings (Forged Manganese Steel)
Manganese Steel Forge Co.

Pipe
L. B. Foster Co.
Manganese Steel Forge Co. (Rolled Manganese Dredge Pipe)
R. D. Wood & Co.

Pipe Flanges
Georgia Iron Works

Plates (Steel)
Blaw-Knox Co.

Plug Valves (See Valves)

Pneumatic Drills (See Drills)

Poidometers
Schaffer Poidometer Co.

Portable Conveyors
Austin Manufacturing Co.
Fuller Co.
Link-Belt Co.
Stephens-Adamson Mfg. Co.

Portable Engines
Climax Engineering Co.

Portable Loaders
Jeffrey Mfg. Co.

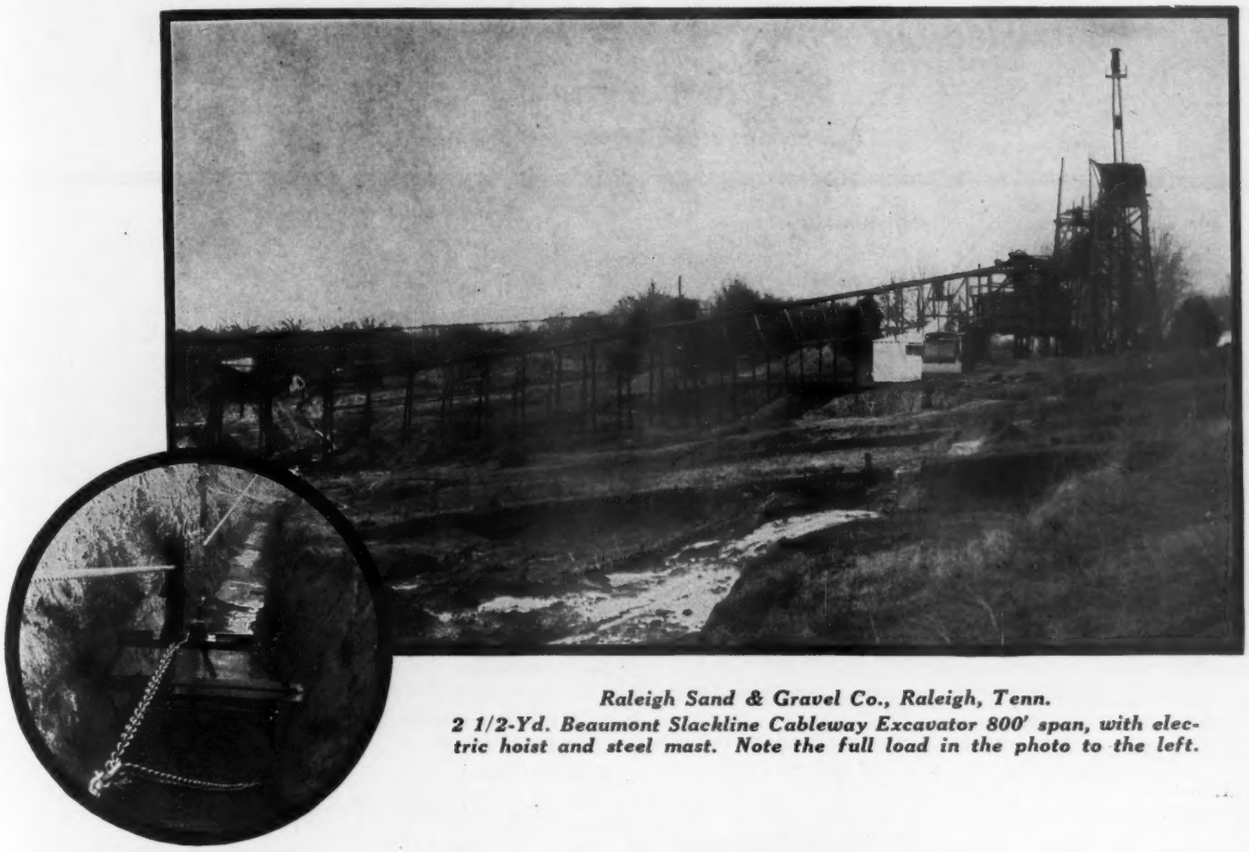
Powder (Blasting)
Hercules Powder Co.

Power Units
Climax Engineering Co.
Fairbanks, Morse & Co.
Hercules Motors Corp.
Power Mfg. Co.
Wisconsin Motor Mfg. Co.

Pulleys (Friction Clutch)
Power Mfg. Co.

Pulleys (Magnetic) (See Magnetic Pulleys)

Pulverizers (See also Crushers, Mills, etc.)
Allis-Chalmers Mfg. Co.
Bethlehem Steel Co.
Bonnot Co.
Bradley Pulverizer Co.
Dixie Machinery Mfg. Co.
Fuller Lehigh Co.
Gruendler Patent Crusher & Pulverizer Co.
Hardinge Co.
Jeffrey Mfg. Co.



Raleigh Sand & Gravel Co., Raleigh, Tenn.
2 1/2-Yd. Beaumont Slackline Cableway Excavator 800' span, with electric hoist and steel mast. Note the full load in the photo to the left.

One Beaumont Slackline— Cableway sells another

When the Osage Gravel Co. were in the market for a 2-yd. slackline cableway to replace a hydraulic system at their Vincennes, Ind., operation, Beaumont Co. was asked to submit prices. A letter written by their Mr. Rehnquist to the Raleigh people brought such an enthusiastic recommendation from Mr. Herbert, their President, that the order was placed immediately with Beaumont for a complete outfit, including a steel mast and 150 H.P. Boiler.

You, too, can secure the many advantages built into the Beaumont outfit, by using it on your next operation. One customer says—"This is the 'digginest' bucket I ever saw. . . ."

Beaumont Co. have been in the business of building material handling equipment for over 25 years. A large engineering organization devotes its entire efforts to the production of a few devices — Slackline Cableway Excavators, Cable Drag Scrapers, Skip Hoists, and Steel Bunkers, and Bin Gates.

This specialized organization is yours to command. An inquiry will bring a prompt response and if a call at your plant will help in solving your problem, one of our engineers will be placed at your service.

Write for catalog on either slacklines or drag scrapers.

REMEMBER—THE SLACKLINE DIGS, ELEVATES AND CONVEYS, ALL UNDER THE CONTROL OF ONE MAN

R·H· BEAUMONT CO.

313 Arch St., Philadelphia, Pa. **1544-C, Straus Bldg., Chicago, Ill.**

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 160

Kent Mill Co.
Polysius Corporation
Raymond Bros. Impact Pulv. Co
F. L. Smidth & Co.
Sturtevant Mill Co.
Universal Crusher Co.

Pumps (Air Lift)
Fuller Co.
Pennsylvania Pump & Compressor Co.
Sullivan Machinery Co.

Pumps (Cement Slurry)
The Dorr Co.
Fuller Co.
Polysius Corporation
F. L. Smidth & Co.
A. R. Wilfley & Sons

Pumps (Centrifugal)
Allis-Chalmers Mfg. Co.
Bethlehem Steel Co.
Fairbanks, Morse & Co.
Hetherington & Berner, Inc.
Pennsylvania Pump & Compressor Co.
A. R. Wilfley & Sons

Pumps (Pulverized Fuel)
Fuller Lehigh Co.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co.
Georgia Iron Works
Hetherington & Berner, Inc.
A. R. Wilfley & Sons

Quarry Development
E. J. Longyear Co.

Rails
Bethlehem Steel Co.
Easton Car & Construction Co.
L. B. Foster Co.
Hyman-Michaels Co.
Morrison & Risman Co., Inc.

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General Refractories Co.

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Oxweld Acetylene Co.

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Blaw-Knox Co.
Bucyrus-Erie Co.
Caterpillar Tractor Co.
Harnischfeger Corp. (Pawling & Harnischfeger)
Koehring Co.
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Universal Road Machinery Co.

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Traylor Eng. & Mfg. Co.

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Magnetic Mfg. Co.

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Komnick Machy. Co., Inc.

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Sand Settling Tanks
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Stephens-Adamson Mfg. Co.
F. M. Welch Eng. Service.

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Fairbanks, Morse & Co.

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R. H. Beaumont Co.
Hayward Co.
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Austin Mfg. Co.
Chain Belt Co.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
Cross Engineering Co.
Galland-Henning Mfg. Co.
Rubert M. Gay & Co. (Vibrating)
Gruendler Patent Crusher & Pulverizer Co.
Hardinge Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.
Industrial Brownhoist Corp.
Jeffrey Mfg. Co.
Kent Mill Co.
Link-Belt Co.
Manganese Steel Forge Co.
McLanahan-Stone Mach. Co.
Polysius Corporation
Robins Conveying Belt Co.
Simplicity Engineering Co.
Orville Simpson Co. (Gyrating)
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Sturtevant Mill Co.
W. Toepfer & Sons Co.
Traylor Eng. & Mfg. Co.
W. S. Tyler Co.
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Universal Vibrating Screen Co.
F. M. Welch Eng. Service

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Monighan Machine Co.
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F. L. Smidth & Co.

Skip Hoists and Skips
R. H. Beaumont Co.
Link-Belt Co.
Stephens-Adamson Mfg. Co.
F. M. Welch Eng. Service.

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A. Leschen & Sons Rope Co.

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Philadelphia Gear Works
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Magnetic Mfg. Co.

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Fuller Lehigh Co.
Horsburgh & Scott Co.
Jeffrey Mfg. Co.
Philadelphia Gear Works

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Bethlehem Steel Co.

Steel Fabrication
H. K. Ferguson Co.

Steel Plate Construction
Hendrick Mfg. Co.

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Bethlehem Steel Co.

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Kerlow Steel Flooring Co.

Stokers
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Stone Grapples—See Grapples (Stone)

Storage Equipment
R. H. Beaumont Co.
Sauerman Bros.

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Consolidated Concrete Machinery Corp.

Tanks
Blaw-Knox Co.
The Dorr Co.
Smith Engineering Works

Thickeners
The Dorr Co.
Hardinge Co.

Tile (Concrete) Machinery
Consolidated Concrete Machinery Corp.

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Bethlehem Steel Co.

Tools, Drill (See Drilling Accessories)

Torches
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Oxweld Acetylene Co.

Track Equipment
Atlas Car & Mfg. Co.
Bethlehem Steel Co.
Easton Car & Construction Co.
L. B. Foster Co.

Tractors
Caterpillar Tractor Co.

Trailer Cranes (See Cranes)

Tramways (Aerial Wire Rope)
Broderick & Bascom Rope Co.
Interstate Equipment Corp.

Transmission Belting
B. F. Goodrich Rubber Co.
Goodyear Tire & Rubber Co., Inc.

Transmission Machinery
Allis-Chalmers Mfg. Co.
Cleveland Worm & Gear Co.
Hyatt Roller Bearing Co.
Kritzer Co.
Stephens-Adamson Mfg. Co.

Trenchers (Wheel & Ladder Type)
Harnischfeger Corp. (Pawling & Harnischfeger)

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Tube Mills (See Mills, Ball, Tube, etc.)

Tube Mill Liners (See Mill Liners)

Tubing (Blasting)
B. F. Goodrich Rubber Co.

Tunnelling Machinery
Bucyrus-Erie Co.
E. J. Longyear Co.

Turntables
Easton Car & Construction Co.

Underground Loaders
Bucyrus-Erie Co.
Thew Shovel Co.

Valves
Linde Air Products Co.
Merco Nordstrom Valve Co. (Lubricated Plug)
Oxweld Acetylene Co.

Valves (Pump)
B. F. Goodrich Rubber Co.

Vibrating Screens (See Screens)

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co.
The Dorr Co.
McLanahan-Stone Mach. Co.
F. L. Smidth & Co.
Smith Engineering Works
Stephens Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
F. M. Welch Eng. Service

Weighing Equipment
Fairbanks, Morse & Co.
Merrick Scale Mfg. Co. (Automatic Proportioning)
Schaffer Poidometer Co.

Welding and Cutting Apparatus
Linde Air Products Co.
Oxweld Acetylene Co.

Well Drills (See Drills, Well)

Wheels (Car)
Easton Car & Construction Co.
Fuller Lehigh Co.
Vulcan Iron Works

Winches and Capstans
Dobbie Foundry & Machine Co.
Mundy Sales Corp.

Wire Cloth
Cleveland Wire Cloth & Mfg. Co.
Manganese Steel Forge Co.
W. S. Tyler Co.

Wire (Manganese Steel)
Manganese Steel Forge Co.

Wire Rope
American Cable Co.
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.

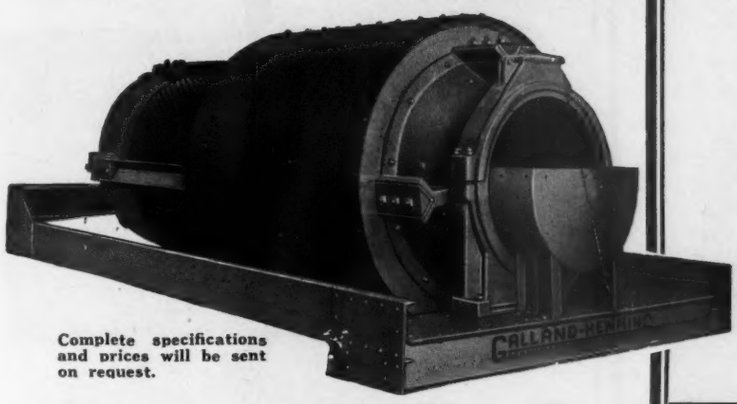
Wire Rope Fittings
American Cable Co.
Broderick & Bascom Rope Co.
A. Leschen & Sons Rope Co.

Wire Rope Slings
American Cable Co.

Worm Gears (See Gears)

Maintenance Costs are Minimized..

Rollerless Rotary..

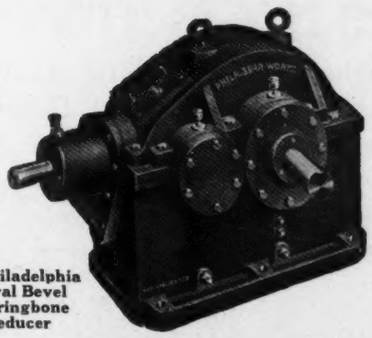


Complete specifications and prices will be sent on request.

A MINIMUM number of moving parts, obtained through the elimination of Rollers and Riding Rings marks the Rollerless Rotary as one of the simplest screens so far designed. Only two bearings are required, and these are of extra large diameter—giving bearing surfaces more than ample.

Exceptionally rugged construction, efficient lubrication, removable feed and discharge end liners and other practical features of the Rollerless Rotary all contribute to its well known qualities of LONG SERVICE and LOW MAINTENANCE.

GALLAND-HENNING
MANUFACTURING COMPANY
MILWAUKEE — U. S. A.



A Philadelphia Spiral Bevel Herringbone Reducer

Speed Reducers

are the ideal drive for:

Rotary Kilns
Screw Conveyors
Agitators
Ball Mill Feeders
Hydrators
Rotary Dryers
Bag Cleaners
Slurry Tanks
Grizzlies
Crushers
Feeder Loaders
Mechanical Stokers
Elevators
Screens

Philadelphia
SPEED REDUCING UNITS

— find many uses in the

Rock Products Industry

Regardless of your particular drive requirements, there is a Philadelphia Speed Reducer which will fill the bill. These Units are made in "Every Gear Driven Type" —for all horsepowers up to 200, and in all ratios.

There are many Philadelphia Reducers installed, or on order for important Cement Mill Drives; in fact, one nationally known cement company ordered 50 Philadelphias for just one of their plants. THERE MUST BE A REASON.

Main Office and Plant Erie Ave. and G St. Phila., Pa.

PHILADELPHIA GEAR WORKS

Manufacturers of Industrial Gears and Speed Reducing Units

PHILADELPHIA, PENNA.
Branch Sales and Engineering Office: 12 E. 41st St., New York

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED — POSITIONS VACANT
Two cents a word Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, thirty inches to the page.

CLASSIFIED—Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

USED EQUIPMENT

REBUILT LOCOMOTIVES

72-ton American 6-wheel switcher, separate tender, 180 lb. steam. Three duplicates.
54-ton Baldwin 6-wheel switcher, separate tender, 200 lb. steam; built 1913.
50-ton Baldwin 6-wheel switcher, separate tender; built 1907.
43-ton Baldwin 6-wheel switcher, separate tender, 180 lb. steam; built 1917.
35-ton Baldwin 4-wheel switcher, separate tender, 180 lb. steam; built 1921.
42-ton American 4-wheel saddle tank, 180 lb. steam; built 1910; Ohio boiler.
31-ton Baldwin 4-wheel saddle tank, 160 lb. steam; built 1914.
21-ton Vulcan 4-wheel saddle tank; built 1922; 36-in. gauge.

REBUILT DUMP CARS

20-yard all steel Western air dump, vertical cylinders. Ten of these.
12-yard steel underframe hand dumps. Seven of these.
6-yard steel underframe hand dumps. Eight of these.

REBUILT LOCOMOTIVE CRANES

22½-ton Ohio 8-wheel 2-line; built 1915.
20-ton Link-Belt 8-wheel, 2-line; built 1916.
15-ton Ohio 8-wheel, 2-line; built 1919.

BIRMINGHAM RAIL & LOCOMOTIVE COMPANY
Birmingham Alabama

FOR SALE

1—5′x6′ Edison Giant Roll.
200 tons 60 lb. Relaying Rails.
1—2″x6″ Laboratory Jaw Crusher.
1—Set 36″x30″ Smooth Rolls.
1—Set 18″x24″ Spike Rolls.
2—10′ Morgan Gas Producers.
2—8′x6′ Ball Mills.
3—No. 5 McCully Gyratory Crushers.
1—No. 7½ Kennedy Gyratory Crusher.
5—8′x125′ Rotary Kilns.
1—9′x100′ Rotary Kiln.
1—7½′x80′ Rotary Kiln.
5—5′x50′ Rotary Coolers or Dryers.

Equipment Sales Company
Richmond, Virginia, and
Benson Mines, N. Y.

FOR SALE

1—75 H.P. Electric Stripping Outfit.
1—Gas Portable Core Drill.
1—No. 3 Gates Gyratory Crusher with Screens.
1—No. 9-K Gates Gyratory Crusher.
2—No. 8-D Gates Gyratory Crushers.
1—No. 5 Telsmith Gyratory Crusher.
1—No. 7 Williams Fine Grinder.
1—No. 7½-D Gates Gyratory Crusher.
1—18″x36″ Farrell Jaw Crusher.
1—36″x48″ Traylor Bull Dog Crusher.
1—No. 6 Austin Gyratory Crusher.
2—No. 5-K Gates Crushers.
1—Complete 400 Yard Gravel Plant.
1—Complete Small Stucco Plant.
1—6′x22″ Hardinge Conical Ball Mill.
1—41-ton Baldwin Standard Gauge Locomotive.
2—Complete ¾-yd. Gas Cableway Outfits; 1 steam.
1—Sauerman 1-yd. Outfit, without power.
1—Sauerman 2-yd. Electric Outfit, complete.
1—New 200 H.P. G. E. Motor.
1—65′ Center Bucket Elevator.
50—Steam and Electric Channelers.
1—33″ Fuller Mill.
1—3′x30′ Indirect Fired Dryer.
1—42″ Gas Whitcomb Locomotive.
1—150′ Matthew Gravity Conveyor.

Send us your inquiries and we will send you our offerings from our $15,000,000 Listing.

National Equipment Company
Bloomington, Indiana

32 ton, American, 32-in. wheel centers, 175 lbs. pressure, air and steam brakes; completely overhauled.

75 ton, 21x26-in., 6-wheel switcher, piston valve, Walschaert valve gear, superheated; built Dec., 1922.
50 ton, saddle tank, new boiler, new cylinders, new tank, new tires.
17—16-yd. Western dump cars, rebuilt; new bodies, steel lined floors.
10—20-yd. Western dump cars, all steel, vertical air cylinders.

HAVE FORTY LOCOMOTIVES, OVERHAULED AND READY, 5 TO 100 TONS, CARS, SHOVELS, CRANES, RAIL, ETC.

ALSO
LOCOMOTIVE SPRINGS, MANUFACTURED AT OUR WORKS HERE

SOUTHERN IRON & EQUIPMENT COMPANY
(Est. 1889)
ATLANTA - - - - - GEORGIA

MOTOR

52 H.P. G. E. slip ring hoist type, 3 ph., 60 cy., 440 volts, 600 rpm. resistance and reversible drum controller.

DRILL SHARPENER

One I.-R. No. 5, with dies, ¾ in. to 1⅜ in.

AIR COMPRESSOR

One I.-R. 210 ft. portable gasoline engine driven.

BOILERS

Two Springfield Dry Back Scotch Marine type, 150 H.P. each, 135 lbs. steam, 96 in. diam. x 18 ft. long.

CRUSHERS

36x24 Farrell Jaw, Manganese fitted No. 5 Austin, Manganese fitted.

DUMP CARS

Thirty 4-yd. 36 in. ga. Western Steel Beam Portable Track, Rails, Cars, Steel Piling. In stock. Immediate shipment.

Hyman-Michaels Company
Peoples Gas Bldg. Chicago, Ill. Railway Exchange St. Louis, Mo.

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED — POSITIONS VACANT
Two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
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CLASSIFIED—Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

USED EQUIPMENT

MACHINERY FOR SALE

ROTARY CRUSHERS
Three No. 0, Three No. 1, One No. 1½, One No. 2 Sturtevant Rotary Fine Crushers, Three No. 0, One No. 1 Sturtevant Ring Roll Mill, One No. 2 Duplex Sturtevant Ring Roll Mill.

GYRATORY CRUSHERS
All sizes from No. 2 Reduction up to 12K.

JAW CRUSHERS
One 2"x6", Two 7"x10", Two 9"x15", One 6"x20", One 10"x15", One 10"x20", Two 12"x24", One 13"x30", One 15"x36", One 18"x36", One 24"x36", One 22"x50", One 36"x48", One 40"x42", One 60"x84".

CRUSHING ROLLS
One 8"x6", Two 16"x10", Three 30"x10", Two 36"x16", Two 42"x16", One 54"x24", Two 14"x20", and One 24"x12" Crushing Rolls.

DRYERS
One 3'x20', Three 4'x30', One 5'x40', Two 5½'x 40', One 6'x60', One 7'x60', and Two 8'x80' Direct Heat Rotary Dryers, One 5'x25', One 6'x30' Ruggles Coles type "A" and One 4'x 20' Ruggles Coles type "B" Double Shell Rotary Dryers, Three 6'x25' Louisville Dryers.

KILNS
One 4'x40', Two 6'x60', Two 6'x90', One 6'x 100', One 6'x120', One 7½'x80', Three 8'x 125'.

HARDINGE MILLS
Two 3', Three 4½', Three 6' and Two 8' Hardinge Mills.

SWING HAMMER AND TUBE MILLS
Fuller, Griffin and Raymond Mills, Screens, Air Separators, etc.

SPECIAL
One No. 6 Williams Universal Pulverizer.

THE HEINEKEN ENGINEERING CORP.
95 Liberty St. New York City
Telephone Hanover 2450

CRUSHER
Acme 10x18 Portable with Elevator, Screen and Hopper. N. M.

DREDGE PUMPS
2—American, 15 inch, A. C., motor drive. N. M.
2—Morris, 8 inch, steam drive. G.
2—Morris, 6 inch, steam drive. G.

CENTRIFUGAL WATER PUMPS
10—Allis Chalmers, 10 inch, 180 ft. head, motor drive. N. M.
1—Morris, 12 inch, steam drive. G.
1—Morris, 3 inch, 320 ft. head, motor drive. N. M.

DRAGLINES
Bucyrus, Class 24, Electric. N. M.
Bucyrus, Class 14, Steam. N. M.
P. & H., 206, Gasoline Caterpillar. N. M.

DUMP CARS
4—Western, 6 yd., standard gauge. S. C.
8—K. & J., 4 yd., 36 inch gauge. G.

STEAM HOISTS
2—Stroudsburg, 8¼x10, D. C., 3 drum. N. M.
4—American, 7x10, D. C., 2 drum. G.
2—Lambert, 5½x8, D. C., 2 drum. G.
All with or without Boilers.

STONE SCREEN
1—Heavy Duty, 3 ft. x 12 ft., Roller type, A. C., motor drive. N. M.
N. M. items located at New Milford, Conn.
G. items located at Golconda, Ill.
S. C. items located at Sioux City, Iowa.

For prices or information address
THE U. G. I. CONTRACTING CO.
Attention: R. C. Stanhope, Jr.
Supervisor of Equipment
U. G. I. Bldg. Philadelphia, Pa.

3—Clyde 82 H.P. Single Fric. Drum Electric Hoists.

Drum 26-in. diam. x 30 in. face; 82 hp. G. E. hoist, motor 3 ph., 60 cy., 220-440 volts, duty 7000 lb. hoist; 300 ft. p. m.; steel gears. Like new. For inclines, car pullers, hoisting, etc.

Hyman-Michaels Co.
Peoples Gas Bldg. Chicago, Ill.
Railway Exchange St. Louis, Mo.

Cranes—Shovels
Sale or Rent

LINK-BELT 20-ton Capt., 8W, 50' B. D. D. 54", Code boiler.
O. & S. Electric, 220 v., 60 cy., 3 ph.; std. gauge, 4-wheel, 35' boom, ¾-yd. Hayward bucket. Fine shape. Sell cheap.
OSGOOD 1¼-yd. Cats., Code boiler; fine shape. Price less half new.
BROWNING 15-ton Capt., 45' boom, D. D., 8-wheel, std. Code boiler; fine condition; located Ohio.
BATCHBIN, Johnson, 50-ton; new; never erected. Price $900.

Locomotive Crane Co.
Bourse Building, Philadelphia, Pa.

In stock 250—24" gauge 2-way Western and Austin dump cars, one and one and one-half yard capacity, in good serviceable second-hand condition. Also a number of new "V" shaped dump cars, 24" gauge: rails, new and relaying and all sorts of tracks supplies of all sections.

Park Row Bldg. New York City
M. K. FRANK
Union Trust Bldg. Pittsburgh, Pa.

CRAWLER SHOVELS
1—MARION 37, STEAM, Shop No. 5550 series, new late 1926; 1¾-yd. Dipper; Nat. Board Boiler; like new.
1—LORAIN-60, GASOLINE; new July, 1927; 1-yd. Dipper; HIGH LIFT, like new.

CRANES
1—15-ton cap. LINK-BELT K-2, GASOLINE, Caterpillar Crane, new 1926; 50 ft. boom, bucket operating.
2—25-ton, 8-wheel, INDUSTRIAL, Type G, Locomotive Cranes, new 1927, 50 ft. booms.

DUMP CARS
25—5-yd., 36" gauge, WESTERN, two-way side dump, new 1927; STEEL DRAFT BEAMS; used few months; perfect condition.

Grey Steel Products Company
111 Broadway New York, N. Y.

Machinery for Sale

JAW CRUSHERS—2½x4; 4x12; 8x10; 9x15; 10x20; 12x24; 13x30; 24x36; 30x42; 60x84.

GYRATORY CRUSHERS—All sizes, various makes.

CRUSHING ROLLS—8x5; 20x14; 21x11; 24x 10; 24x14; 30x16; 36x16; 42x16.

DRYERS AND KILNS—Single shell—3½x16; 4x20; 4x30; 4'9"x36; 5x25; 5x50; 5½x40; 6x 40; 7x70; 7x100; 8x80; 9x124; Double shell—3x16; 4x20; 5x30; 6x40; 8x85.

TUBE MILLS—3'x12", 4x16; 5x20; 5x22; 5'6" x16; 5'6"x20.

HARDINGE MILLS—3'x8"; 4½x16; 5x22; 6x 22; 8x30; 8x36; 8x48.

PULVERIZERS—2-, 3-, 4-, 5-roll, high and low side Raymond Mills, also Beater types; 33" to 42" Fuller Lehigh Mills, Griffin Mills.

SWING HAMMER MILLS—All sizes—Williams, Jeffrey, Gruendler, Pennsylvania.

Send us your inquiries
Send us a list of your surplus machinery

Consolidated Products Company, Inc.
15-16-17 Park Row N. Y. C. Barclay 0603

Crushers No. 12, 10, 9, 8, 7, 6, 5, 4
Roll Crushers
84x72, 36x60, 72x30, 18x30
Jaw Crushers
36x48—40x42—26x50—24x36—20x34—60x84
12x37—18x36—13x30—7x24—7x16—10x22
DISC CRUSHERS, 48", 36", 24", 18"
3 Oil Engines 200 H. P., New
Other Oil Engines, 50-850 H.P.
¾—1 AND 1½—2½-YD. CAT SHOVELS
5 Ton Crane 70' Span A C Motors
AIR COMP.—HOISTS—KILNS
DRAG LINES—LOCO. CRANES—MOTORS
Ross Power Equipment Co.
13 South Meridian St. Indianapolis, Ind.

FOR SALE

120 H.P. Solid Injection Anderson Oil Engine, Type K, No. 4100, in good condition.

Tulsa Sand Company
Tulsa, Oklahoma

FOR SALE

SPECIAL—Gypsum calcining and mixing plant consisting of 4-roll Raymond Mill; 4½ x 52½ ft. Calciner; 4x30 Ruggles-Coles Dryer; three Broughton Mixers, Style A-1, A-2, B-1; Hair Picker; 30 and 36 in. buhr-stone mills.

4x30 American Process Steam Dryer.
42"x40" Rotary Kiln.
8'x80' Single Shell Dryer.
3-, 4- and 5-roll Raymond Mills.
No. 1, 00, 0000 Raymond Mills.
6x22 and 8x48 Hardinge Mills.
4½x12 ft. Allis-Chalmers Tube Mill.
Infant, No. 2 and No. 6 Williams Mills.
5x30, 80"x45' and 8'8"x85' Ruggles-Coles Class A Dryers.

Robert P. Kehoe Machinery Company
7 East 42nd Street New York, N. Y.

CLASSIFIED ADVERTISEMENTS

USED EQUIPMENT

500 Tons

30 lb. Rails

Reconditioned

and serviceable as new

Priced to sell now

and all other weights

ZELNICKER IN ST. LOUIS

Air Compressors

Three Chicago Pneumatic, 212 ft., 80 to 100 lb. air pressure, Type N-SO2, direct Diesel oil engine driven, on 4 steel wheels, air tank, water tank, $975.00 each, f.o.b. St. Louis.

Hyman-Michaels Company

Peoples Gas Bldg. Chicago, Ill. — Railway Exchange St. Louis, Mo.

RAILS New and Relay

ALL WEIGHTS AND SECTIONS
FROGS—SWITCHES—TIE PLATES

S. W. LINDHEIMER

38 S. Dearborn St. Chicago, Ill.

FOR SALE

1—4'x26' Cummer Dryer.
1—5'x50' Bonnot Dryer.
2—36" Bonnot Pulverizers.
1—5'x4' Allis-Chalmers Ball Mill.
2—50-ton Coal Hoppers.
Bucket Elevators and Screw Conveyors.

J. S. LEWIS, Jonesville, Mich.

UNIVERSAL CRUSHER COMPANY
Eastern Agents

All Steel Jaw Crushers. Also used equipment in crushing and power lines.

HOOPER-MOMBERGER CO.
90 West St., New York City Phone Rector 2919

Bargain Prices
100,000 Lbs. Capacity
ALL STEEL ORE HOPPER DUMP CARS
MCB condition. Ready for service.
Cheap freight to any part U. S. A.
DULUTH IRON & METAL COMPANY
Duluth, Minn.

Used Equipment

Sell your discarded equipment! It's probably worth more than you realize. Try an advertisement in this section.

USED EQUIPMENT

Steam Shovel and Crusher For Sale

Owing to change in our operations we have for sale one Marion Steam Shovel, Model 21, Shop No. 4473, together with lot of spare parts, in first class second-hand condition, $3,750. Also one No. 6 McCully Crusher in good second-hand condition, $1,000. Both f.o.b. cars.

Stockbridge Stone Co., Stockbridge, Ga.

BUSINESS OPPORTUNITIES

AUCTION

By order of the Circuit Court of Cook County we will on

Friday, March 30th, 1928, at 11:00 a. m.

at

6655 So. Central Ave., Clearing, Ill.

sell at public auction the real estate and personal property of the

COMMERCIAL PULVERIZING CO., a Corp.

Appraised value in excess of $140,000

Real Estate

1½ acres of ground with approximately 300 ft. switch track improved with 5 buildings

Equipment

This plant has modern equipment for receiving crude minerals, wet or dry, and converting same to finely pulverized dry products and large storage capacity for both crude and finished materials, duplicate receiving conveyors, crushers and dryers.

Descriptive circular on application to the undersigned
Samuel Frank, Receiver
Philip A. Weinstein, Atty. for Receiver

MICHAEL TAUBER & COMPANY
Auctioneers,
411-423 So. Market St. Chicago

FOR SALE

At equipment inventory, one-half interest in paving business, central New York. Original company in operation twenty-two years. Either practical or office man desired. Address

Box 116, care of Rock Products
542 South Dearborn St. Chicago, Ill.

WANTED

To hear from company or corporation interested in a large gypsum deposit which tests 99.72% pure. Will sell or lease on royalty to reliable company.

ED. NOVAK
720 Whedbee St. Ft. Collins, Colo.

PARTNER WANTED

Sand lime brick plant, building of steel frame and brick, unlimited amount of pure silica sand, make a fine hard brick, all machinery ready to run, cheap labor. No brick plant nearer than 80 miles. Albany alone uses a good many millions of brick each year.

ALBANY BRICK CO., Albany, Ga.

USED EQUIPMENT WANTED

WANTED

One standard make caterpillar crane and clam shell. Size ¾ or 1 yd. Must be in first class condition and a bargain.

ARKANSAS SAND & GRAVEL CO.
Box 336 Van Buren, Ark.

BUSINESS OPPORTUNITIES

WANTED

To lease sand or stone plant; must have market for product. Would consider partner.

Address Box 123, care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Quarry for Sale

227 Acres of the Famous Oolitic White, High Calcium Limestone in Ste. Genevieve County, Missouri. The reputation of this particular stone is National in scope, for all purposes, and needs no analysis to prove it. Property can be purchased at a very reasonable price.

Address Box 128, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

If you have a business to sell or lease, or if you wish to buy or lease a business, you will be doing yourself a good turn by placing an advertisement in this department.

CLASSIFIED ADVERTISEMENTS

BUSINESS OPPORTUNITIES

Limestone Property For Sale

A tract of 200 acres of high calcium limestone in north central Illinois—easily accessible—a splendid reserve for a portland cement manufacturer near the great central markets of central and northern Illinois. Analyses of the limestone, the clay overburden and the underlying shale are:

Limestone

Silica	1.50
Iron Oxide	.60
Alumina	.40
Calcium Carbonate	96.45
Magnesium Carbonate	.98

Shale Underlying Stone

Silica	36.64
Iron Oxide	2.20
Alumina	11.80
Calcium Carbonate	42.13
Magnesium Carbonate	3.36

Surface Clay of about 3 feet

Silica	67.00
Iron Oxide	4.30
Alumina	12.38
Lime	1.80
Magnesia	.49

Address Box 127, care of ROCK PRODUCTS
542 South Dearborn Street Chicago, Illinois

WILL BUY OR LEASE

Up-to-date rock crushing or gravel plant in good district, preferably in the South. Must be in good condition and going concern. Might consider purchase of land for opening new plant. Give all details in first reply.

Address Box 124, care of Rock Products
542 South Dearborn St. Chicago, Ill.

FOR SALE

Sand and gravel plant with leases. Established business, Benton, Ark., near center of state; two railroads; several years of large road program ahead.

Write E. L. HUDDLESTON
2204 Summit Ave. Little Rock, Ark.

FOR SALE

Cement tile and block factory. Located at Eaton, Ohio. Buildings and equipment in first class condition; machinery electrically driven. A real business proposition that would not be for sale but for the death of the owner.

EVERETT GARDNER, Realtor, Eaton, O.

SITUATIONS VACANT

Sales Engineer

An unusual opportunity awaits a graduate engineer 33-40, who has proven that he is a real salesman and has a thorough knowledge of Fan Engineering and Dust Collecting. Send full particulars of education, places employed, duties, salary, etc. Replies will be treated in strict confidence.

Box No. 121
Care of Rock Products
542 S. Dearborn St., Chicago, Ill.

SITUATIONS VACANT

FIRST CLASS DESIGNER

Familiar with Dust Arresters

—Who is between 35 and 40 years old.
—Who is a graduate Mechanical Engineer.
—Who has a thorough knowledge of Fan Operation, preferably experienced in Dust Handling Problems, also in making Piping Lay-Outs, etc., and has proven ability as a Designer.
—Who would be capable of taking a leading part in the designing of a line of Cloth Screen and other types of Dust Arresters, also Apparatus for Classifying and Conveying of Materials by Air.
—Who has had experience in surveying new fields to determine potential possibilities, and preferably some shop experience.
—Who has a pleasing personality, is an enthusiastic worker, inspires confidence, and holds friends.
—Who "gets on" well with fellow workers.
—Who inspires the best in others, is an orderly, efficient worker, and a capable supervisor.
—Who would do justice to an out of the ordinary opportunity.
—Who now holds a good position, which he had no idea of leaving.
—Who would enjoy working in a happy business family of young men, where due appreciation is shown for work well done.

The Company seeking this man is a successful, well established enterprise, enjoys first rating, and a high class concern in every sense.

In your first letter give age; education; places employed, duties and salary received; periods of employment and reasons for leaving in each instance; also send photograph and state salary expected.

Your letter will be treated strictly confidential, and no one communicated with before receiving your consent. Prompt interview will be arranged if qualifications suit.

Address Box 120, care of Rock Products
542 South Dearborn Street Chicago, Illinois

MAN—ACTIVE, ENERGETIC, APPROXIMATELY 30 years of age. Must have engineering knowledge or experience with crushed stone, sand and gravel plants and conveying machinery. Give full details in first letter, stating age, experience, college education if any, if married, and salary. Good position open. No experiments or triflers. Address Box 122, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

WANTED—A CHEMIST WITH BROAD EXperience in lime industry. Lime rock and burning. State age, nationality, full experience and references. Address Box 126, care of Rock Products. 542 So. Dearborn St., Chicago, Ill.

SITUATIONS WANTED

AVAILABLE, YOUNG MAN WITH BROAD experience as production clerk and assistant superintendent wishes to make permanent connection with company that will recognize executive ability in the handling of plant shipments, payrolls, operating costs, books and correspondence. Familiar with all phases of crushed stone industry. An adaptable and energetic hustler that can assure efficient results. Address Box 96, care of Rock Products, 542 So. Dearborn Street, Chicago, Ill.

SUPERINTENDENT—DESIRES ENGAGEment; thoroughly familiar with stone crushing, sand and gravel operations; competent and efficient operator; location South or West. Prefer working on bonus basis or tonnage contract. Excellent references. Address Box 99, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

ENGINEER, EXPERIENCED IN DESIGN, construction and operation; cement, lime, crushing, pulverizing, conveying, ore handling and treating plants. Considerable experience in other industrial manufacturing lines. Address Box 2253, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

SUPERINTENDENT—15 YEARS EXPERIence in charge of limestone mines, quarries and lime burning plants. Executive ability and experienced in plant design and construction, mine and quarry development. Address Box 112, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

SITUATIONS VACANT

WANT QUARRY FOREMAN—EXPERIenced in drilling and blasting rock and operating electric shovels to come with a live and fast growing organization. Must be able to handle men. In first letter give references and where now employed; also salary expected. Address Box 125, care of Rock Products, 542 So. Dearborn Street, Chicago, Ill.

WANTED—CHIEF CHEMIST FOR A CEment plant advantageously located in the South, working on the wet process; one with thorough knowledge and experience in cement chemistry and manufacture. Address, stating experience and salary, "Volunteer," Box 865, Charleston, S. C.

SITUATIONS WANTED

WANTED—POSITION AS CHIEF CHEMist in cement plant. Have had broad experience in the cement industry with 18 years actual operation. Thorough knowledge of quarry and mill supervision, burning with oil or coal, wet or dry process. Age 37 and married. Can furnish complete record with best of reference. Address Box 100, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

CONNECTION WANTED BY A QUARRY superintendent of sixteen years' experience in the operation of quarries. Conversant with the detail of design and economical operation of quarry, crushing plant, etc. Practical knowledge of electricity and various methods of blasting. More interested in good connection than large salary. Will guarantee maximum production at low cost with equipment available. Reference from past connections. Address Box 95, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

Situation Wanted

Those seeking positions can readily find them by making their wants known to a large number of employers who read the advertisements in this section.

INDEX TO ADVERTISEMENTS